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**TECHNICAL REPORT
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**MAINTENANCE MANUAL FOR THE
AUTOMATED AIRDROP INFORMATION
RETRIEVAL SYSTEM - HUMAN FACTORS
DATABASE**

**By
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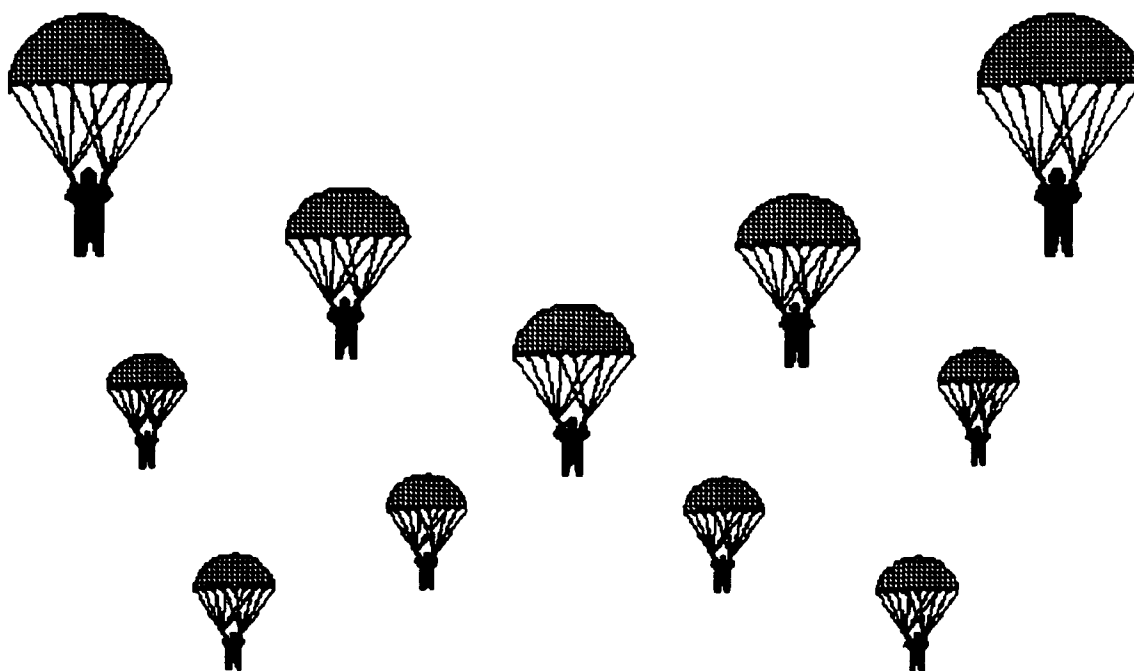
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13. ABSTRACT (Maximum 200 words) The Automated Airdrop Information Retrieval System - Human Factors Database (AAIRS-HFD) is a computerized system for the management of literature regarding human factors issues as related to airdrop systems/components. Two major categories define the focus and content of the database: (1) Human Factors Issues major topics include: Airdrop Delivery Method; Jump Mission Characteristics; Airdrop Tasks & Procedures; Hazards & Emergencies; Aerospace Biomechanical Factors; Aerospace Physiological/Medical Factors; Psychological Factors; Personnel Attributes; Load/Cargo Attributes; and Other Airdrop Human Factors Issues and (2) Airdrop Systems/Components major topics include: Static Line Personnel Parachute Assembly; Military Free Fall Personnel Parachute Assembly; Tandem Personnel Parachute System; Individual Equipment & Weapons Containers; Container Release Assemblies; Individual Protective/Life Support Equipment; Cargo/Resupply Parachute Assembly; Free Fall Cargo/Resupply Parachute Assemblies; Cargo/Resupply Container Systems; Cargo/Resupply Platform Systems; Tools & Equipment for Rigging; Tools & Equipment for Derigging; Aircraft Components; Training Devices; and Other Airdrop Systems/Components. System capabilities include: text and keyword searches; on-screen viewing; printed reports; maintenance of source and keyword databases; and automated backups. This report contains detailed information regarding the operation of AAIRS-HFD's maintenance module including instructions for installing the system, editing/appendding the source database, adding/deleting keywords and backing up the system.				
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PREFACE

This report on the operation of Natick's Airdrop Database was prepared by Ms. Paula M. Poble and Ms. Debra Meyers of GEO-CENTERS, INC., Newton Centre, Massachusetts, under Army contract DAAK60-90-D-0002, and by Ms. Marcie S. Kronberg of the Human Factors and Ergonomics Branch, Behavioral Sciences Division, Science and Technology Directorate, U.S. Army Natick Research, Development and Engineering Center (Natick).

Establishment of Natick's AAIRS-HFD has been made possible through funds provided by the Mobility Directorate of Natick. The authors received input from several sources and installations during the development and refinement of the Human Factors Issues and Airdrop Systems/Components Taxonomies. The authors would like to thank members of the Mobility Directorate of Natick including: Mr. Maurice Gionfriddo, Mr. John Greendale, Mr. John Mahon, Mr. Bruce Riggins, Mr. Robert Rodier, Mr. Gary Thibault, Mr. Edward Giebutowski, Ms. Sarah Morgan, Mr. Peter Wallace, Mr. Robert Auer, Mr. Richard Landry, Mr. William Millette, and Mr. Dennis Crockett; members of the Science and Technology Directorate of Natick including: Dr. Carolyn Bense, Dr. Kenneth Parham and Dr. James Sampson; LTC Bruce Jones and MAJ Paul Amoroso of the United States Army Research Institute of Environmental Medicine (USARIEM); MAJ John Kraugh, formerly of Fort Benning, GA; Mr. Dwight Lindsey of the United States Army Safety Center; Mr. Richard Rosenstein, Ms. Karen Burke and Mr. Robert Woods of GEO-CENTERS, INC. and Mr. Carl Peterson of Sandia National Laboratories.

**Maintenance Manual for the
Automated Airdrop Information Retrieval System -
Human Factors Database (AAIRS-HFD)**

SECTION 1. INTRODUCTION

1.1 Background. Employment of parachutes by the military has given rise to an area of scientific investigation which examines a wide range of human performance characteristics of airborne activities. New capabilities of high performance aircraft have expanded the operational requirements placed on military airborne personnel. This has increased the importance of understanding how human factors can effect the performance of an aerial delivery system. Traditional human factors standards and guidelines used during the materiel design process are not applicable to a majority of these systems. It has become apparent that human factors guidance unique to the design of advanced airdrop systems needs to be established.

Government, industry, academic organizations, and private interest groups have conducted research and generated a diverse body of data related to human factors in airdrop. To a large degree, however, these data have not been documented within the regular channels of literature accession, making it difficult to locate important information critical to the design of airdrop systems. Consequently, the field of human performance in airdrop lacks both definition and structure.

This report describes the steps that have been taken to begin building a framework for study within this field. Specifically, the report presents the Automated Airdrop Information Retrieval System - Human Factors Database (AAIRS-HFD), a Human Factors Issues Taxonomy and an Airdrop Systems/Components Taxonomy. The AAIRS-HFD and the taxonomies are designed to meet the challenges faced by scientists, engineers and other users in assembling information on a given topic concerning human factors issues in airdrop operations or system design. They are also intended to be of assistance in familiarizing new staff members and researchers with this field of study.

1.2 Focus of the Database and Taxonomies. The investigation of airdrop human performance factors involves the application of many technical specialties. Indeed, human performance/airdrop-related information can be found in the following: scientific journals; academic reports; military technical reports; other government agencies' reports; foreign government reports; commercial periodicals, newspapers and magazines; researchers' individual collections; subject matter expert/user feedback; observational data from field exercises; video recordings; and anecdotal stories. Because there is such a broad array of information related to the topic, it was decided that an automated database should be established to help in the organization and accession of literature that is relevant to a number of technical disciplines within the field of airdrop.

The objective of the database is to provide users with information regarding airdrop human factors issues and airdrop systems/components. To accomplish this objective, the database was designed to allow users to conduct two types of keyword searches: A Human Factors Issues Search and An Airdrop Systems/Components Search. The keyword searches would require lists of keywords organized by major topics. Thus, a Human Factors Issues Taxonomy and an Airdrop Systems/Components Taxonomy were created.

The taxonomies consist of information presented in a list-like manner, with hierarchical organization where applicable (see Appendix A). The establishment of the taxonomies has been an evolutionary process with two objectives: to provide the structural framework for the keyword searches in AAIRS-HFD and to act as a reference tool for airdrop professionals applying human factors techniques to the design and development of airdrop systems/components. The taxonomies began as two collections of terms and phrases representing a broad array of airdrop human factors issues and airdrop systems/components. Based on the knowledge of many human factors and airdrop experts, they were organized, classified and refined to workable lists. An on-going, comprehensive review of airdrop literature has also helped to further refine the taxonomies.

The structure of the taxonomies is directly related to the menu structure of AAIRS-HFD. Firstly, each major category of information is made accessible in the database via two independent keyword searches: a Human Factors Issues Search and an Airdrop Systems/Components Search. Likewise, there are two separate taxonomies. Each type of search and taxonomy is organized by major topics. Major topics are accessible via menus in the database. In the taxonomies, major topics are numbered and appear in bolded text that is flush with the left margin (see Figure 1). Under each major topic there are keywords. The database offers keywords via menus for the purpose of assigning them to literature or selecting them for keyword search criteria. In the taxonomies, keywords fall under major topics and appear in regular upper and lower case text that is flush with the left margin (see Figure 1). Some of the keywords have what are referred to as "descriptions". Keyword descriptions consist of additional terms that help further define and classify keywords for the database user. The descriptions may include several "tiers" of indents, with each successive indent being more specific. Keyword descriptions in the database are presented in text windows during the selection of search keywords. In the taxonomies, keyword descriptions appear in lower case text that is indented under respective keywords (see Figure 1).

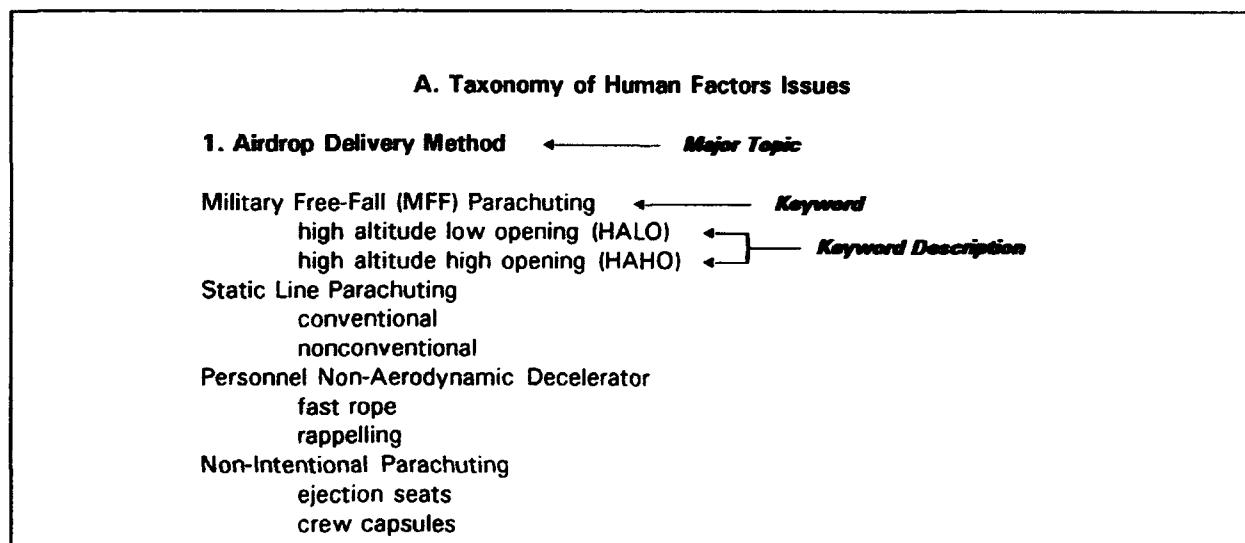


Figure 1. Sample page from Human Factors Issues Taxonomy.

More detail on the menu structure of AAIRS-HFD can be found in Section 4, Processing Reference Guide. The Human Factors Issues Taxonomy and the Airdrop Systems/Components Taxonomy are presented in their entirety in Appendix A. Major Topics for each area are presented below.

Human Factors Issues Major Topics:

- Airdrop Delivery Method
- Jump Mission Characteristics
- Airdrop Tasks & Procedures
- Personnel Parachuting Malfunctions
- Cargo/Resupply Airdrop Malfunctions
- Aerospace Biomechanical Factors
- Aerospace Physiological/Medical Factors
- Injuries/Illnesses
- Psychological Factors
- Personnel Attributes
- Load/Cargo Attributes
- Other Airdrop Human Factors Issues

Airdrop Systems/Components Major Topics:

- Static Line Personnel Parachute Assembly
- Military Free-Fall Personnel Parachute Assembly
- Tandem Personnel Parachute System
- Individual Equipment & Weapons Containers
- Container Release Assemblies
- Individual Protective/Life Support Equipment
- Cargo/Resupply Parachute Assembly
- Cargo/Resupply Container Systems
- Cargo/Resupply Platform Systems
- Tools & Equipment for Rigging
- Tools & Equipment for Derigging
- Aircraft Components
- Training Devices
- Other Airdrop Systems/Components

1.3 General Information on Operation and Administration.

1.3.1 Purpose of the System. The purpose of Natick's AAIRS-HFD is to manage information related to Airdrop Human Factors Issues and Airdrop Systems/Components. The system offers automated access to this information via keyword and text searches. Depending on the user's requirements, the database is capable of displaying information on the screen or generating output in the form of a reference or a detailed report.

1.3.2 Additional Documentation. The following documents may be necessary for the operation of AAIRS-HFD: manual(s) for host PC and printer and manual(s) for host operating system (DOS). Under normal conditions, however, consulting these documents should not be required.

1.3.3 Maintenance of Data. It is projected that the contents of AAIRS-HFD will be maintained by personnel in the Behavioral Sciences Division of the Science and Technology Directorate. Decisions regarding appropriate subject matter for inclusion in the database are made by those who have established, and subsequently, by those who maintain the database. In addition, changes in the state of the art or the pursuit of new lines of research in the field of human factors related to airdrop operations may affect the composition of the database. Knowledge of a password is required to access the maintenance module; therefore, individual users will not be able to modify or augment the database. However, suggestions are welcome and a form for such comments is available in Appendix B.

1.3.4 The Maintenance Manual. The purpose of this maintenance manual is to give personnel responsible for the maintenance of AAIRS-HFD a concise guide containing all the information necessary to complete successful updates of the system. A User Manual for AAIRS-HFD was published as a separate Natick technical report (Poole, Kronberg, & Meyers, 1994).

1.3.5 Security. The literature contained in AAIRS-HFD is unclassified. The inclusion of classified documents is not permitted. A password is not necessary to operate the user module of the system that allows searches and generates output. However, a password is required to operate the maintenance module of the system that allows modification of existing records and appending of new records.

1.3.6 Availability of the Literature in the Database. Users outside of Natick and USARIEM may want to acquire documents summarized in the database. Those users should follow the usual procedures for acquiring such materials. Although the location of source is documented for each literature entry, the staffs of Natick and the Natick Technical Library cannot provide the literature summarized in Natick's AAIRS-HFD.

If an organization is registered with the Defense Technical Information Center (DTIC), members of the organization may obtain technical reports published by the Department of Defense (DoD) and DoD contractors by contacting:

Defense Technical Information Center
Cameron Station
Alexandria, Virginia 22304-6145
Commercial: (202) 274-7633
DSN: 284-7633

Others interested in obtaining DoD technical reports should contact:

U.S. Department of Commerce
National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, Virginia 22161
Commercial: (703) 487-4650

To assist users in obtaining technical reports, the database contains, as part of the reference to such reports, the accession code, or "DTIC" number, used as an identifier by both DTIC and NTIS.

SECTION 2. SYSTEM SUMMARY

2.1 Overview.

2.1.1 Application Summary. A menu-driven user interface allows individuals who are interested in Airdrop Human Factors Issues and Airdrop Systems/Components to gain access to the contents of AAIRS-HFD. The contents of AAIRS-HFD is comprised of literature entries, referred to as records. Each record in AAIRS-HFD contains reference information, textual summaries and keywords. Users are offered two major types of search functions: keyword searches and text searches. After successfully conducting either type of search, the user is given a list of literature that meets the demands of the search specifications. The user can view the contents of each entry on the screen or generate printed output. The maintenance module of AAIRS-HFD allows authorized database maintenance personnel to control what information is stored in the database. The exit module allows user's to properly close the system. In addition, the exit module allows maintenance personnel to run a backup program that stores the updated system onto floppy diskettes.

2.1.1.1 Contents of Literature Entries. The contents of each literature entry or record includes reference-identifying information such as: title, subtitle, author(s), editor(s), volume number, page number(s), day, month(s), year, report number, DTIC/NTIS number, organization, journal, publisher, source location and source type. These pieces of information are called fields and are stored within the source database. Fields applicable to any one record are largely determined by what type of source the information came from. For example, the subtitle, report number, DTIC/NTIS number, editor(s), day and publisher fields would probably remain empty for a journal article.

In addition to reference fields, textual information including an overall summary and applicable comments are stored in memo fields for each literature entry. Human Factors Issues keywords and Airdrop Systems/Components keywords are stored in separate databases, but are associated with the source database through the use of relational databasing techniques.

2.1.1.2 Conducting a Keyword Search. There are two types of keyword searches offered: a "Human Factors Issues Search" and an "Airdrop Systems/Components Search". Each of these searches allow the user to choose one or more major topics of interest involving either Human Factors Issues or Airdrop Systems/Components. Each type of keyword search runs independently from the other. Under each major topical area, the system offers the user a predefined list of applicable keywords. The user can choose up to six keywords from one or more major topics. Before conducting a search, the user connects their selected keywords with an "and" or an "or."

2.1.1.3 Conducting a Text Search. The "Text Search" allows the user to enter text in the form of a partial word, word, phrase, sentence, or several sentences. Text may be searched for in one or more of the following fields: title, subtitle, author(s), editor(s), year, ID/document #, organization, location of source, overall summary and comments. Text searches run independently from keyword searches.

2.1.1.4 On-screen Viewing. Once a keyword or text search has been conducted, the user is presented a list of titles that represent qualifying matches. The user may view a title that is currently highlighted in the list of matches. Viewing a title displays four screens of information, including all applicable reference information, textual summaries, Human Factors Issues keywords and Airdrop Systems/Components keywords assigned to that title. Fields containing lengthy text can be opened up for viewing; on-screen instructions for doing so are available.

2.1.1.5 Printed Output. The user may generate one or more printed reports. Each report consists of either a single title that is currently highlighted in the list of matches or all titles in the list of matches. Also, the user may generate either a reference report or a detailed report. The reference report contains reference information for the chosen literature, whereas the detailed report contains reference information as well as keywords and any applicable textual summaries and comments for the chosen literature.

2.1.1.6 System Maintenance. The maintenance module allows database maintenance personnel to edit existing literature entries and add new literature entries to AAIRS-HFD. In addition, maintenance personnel may add, edit and delete Human Factors Issues and Airdrop Systems/Components keywords and keyword descriptions from a series of keyword lists. As noted earlier, knowledge of a password is required to access this module.

2.1.1.7 General System Tree Diagrams. The main menu of AAIRS-HFD offers four options: Keyword Search, Text Search, Maintain System and Exit. Each of these options are displayed and briefly described in the tree diagrams appearing in Figures 2-5.

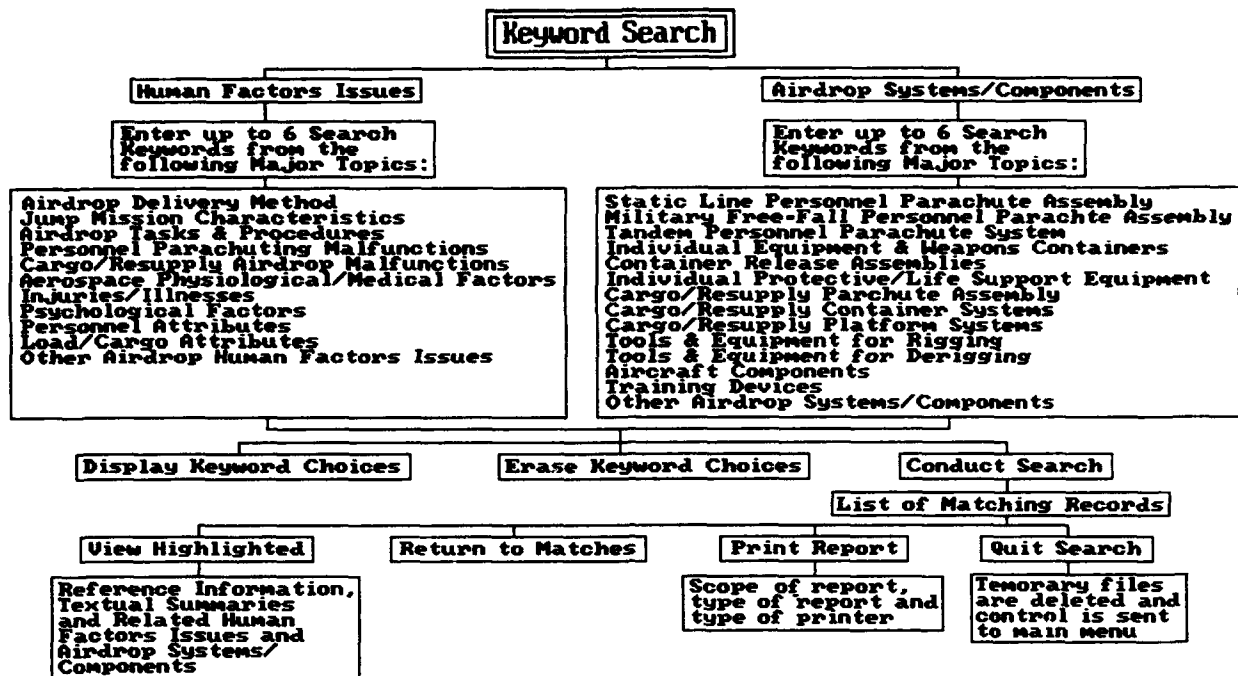


Figure 2. Keyword Search tree diagram.

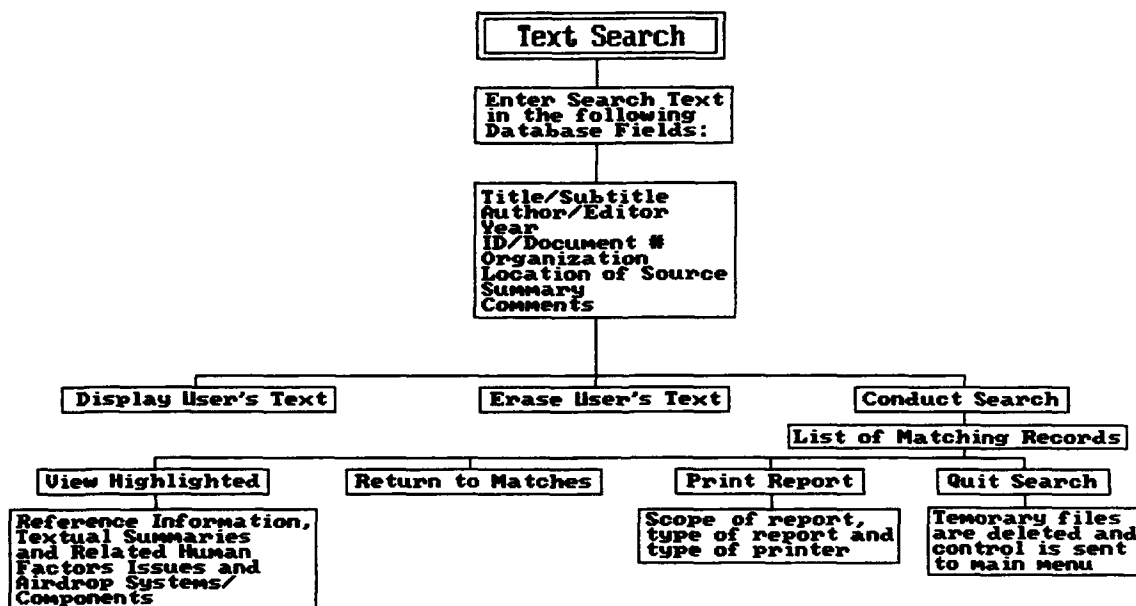


Figure 3. Text Search tree diagram.

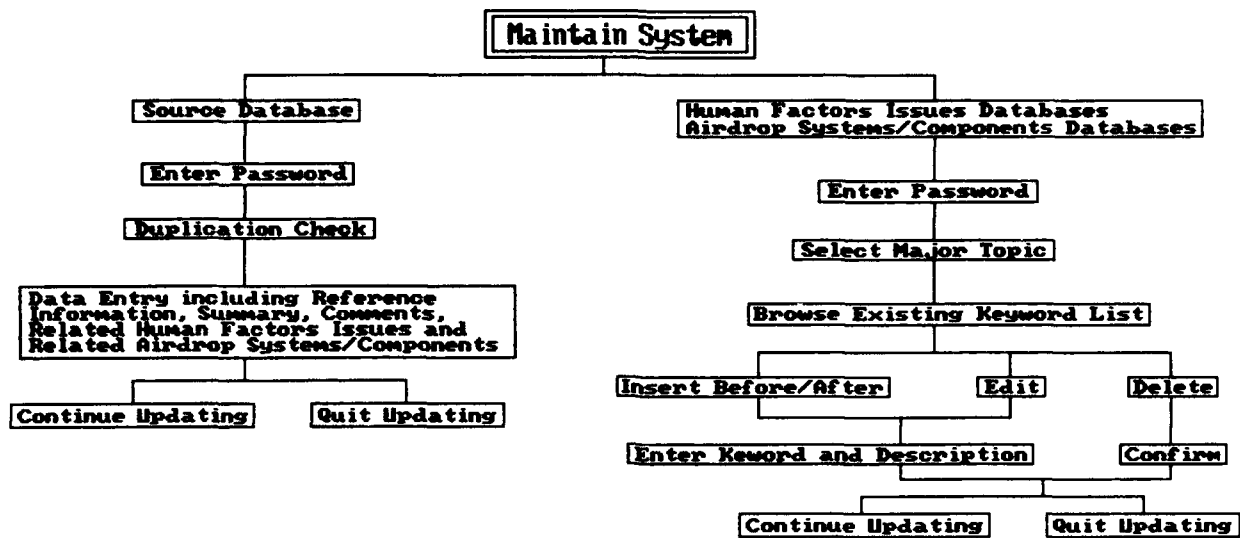


Figure 4. Maintain System tree diagram.

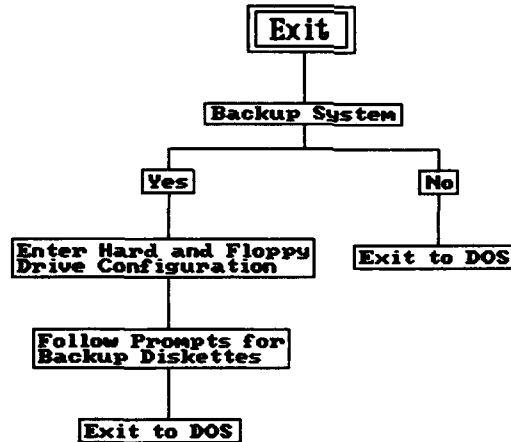


Figure 5. Exit tree diagram.

2.1.2 Controls. Personnel in the Behavioral Sciences Division of the Science and Technology Directorate are responsible for managing the system and providing supervisory controls.

2.2 System Environment.

2.2.1 Hardware Required. A 386 IBM compatible computer with a color monitor, a minimum of 3MB of memory and 3MB of hard disk space is necessary to run the system. A mouse can be used to run the system, but it is not necessary. (Hard disk requirements may increase as the database is further developed.) A printer is not required to use the system for conducting searches and viewing literature, but a printer is required if hard-copy reports are desired.

2.2.2 Software Required. DOS version 3.31 or higher is necessary to support the operation of AAIRS-HFD. DOS version 4.01 or higher, however, should be used by maintenance personnel due to the fact that files backed up with DOS version 4.01 are compatible with systems running on earlier versions of DOS, whereas files backed up with earlier versions of DOS cannot be successfully installed on systems running with DOS 4.01 or higher.

Specific requirements for DOS settings, such as files and buffers statements, are described in Appendix C. CONSULTING THIS APPENDIX SHOULD ONLY BE NECESSARY IF INSTALLATION IS REQUIRED. It should be noted that AAIRS-HFD is supported by the Distribution Kit for FoxPro (v 2.5) which is licensed by Microsoft Corp. FoxPro support files are embedded within the compiled file called "aairs.exe". A complete listing of files needed to run AAIRS-HFD and a complete listing of diskette contents are located in Appendix C.

2.3 Assistance and Problem Reporting. While using the system, assistance may be required or a problem may need to be reported. If the present report does not address the user's needs, the following guidelines should be of assistance.

A Suggestion and Comment Form is available in Appendix B of this manual. Users are encouraged to use these forms to voice suggestions and/or comment on any problems encountered while using the system. If the system is being used on a PC targeted as the AAIRS-HFD Workstation, completed forms may be left at the workstation. If the system has been loaded on any other PC, completed forms may be returned to personnel responsible for distributing the system software. Maintenance personnel are responsible for the management of such reported problems or suggestions.

SECTION 3. ACCESS TO THE SYSTEM

3.1 Use of the System.

3.1.1 Access Control. In order to protect the integrity of the database, the capability for the typical user to modify or supplement existing data is not available. The maintenance module of the system requires users to enter a password, the details of which are explained in this manual.

3.1.2 Installation. Under normal conditions, the database will be used on a PC where it has already been installed. Should software installation be necessary, instructions are located in Appendix C.

3.2 Initiating a Session. To begin a working session with Natick's AAIRS-HFD, the user must change to the directory in which the system has been installed, type *aairs*, and press ← (see Table 1 for instructions). The first screen welcomes the user to Natick's AAIRS-HFD (see Figure 6).

Table 1. Initiating a Session.

What To Type:

What Will Happen:

C:\>cd \aairs ←

Changes to the directory where the system resides.

C:\aairs>aairs ←

Executes start-up file for the system.

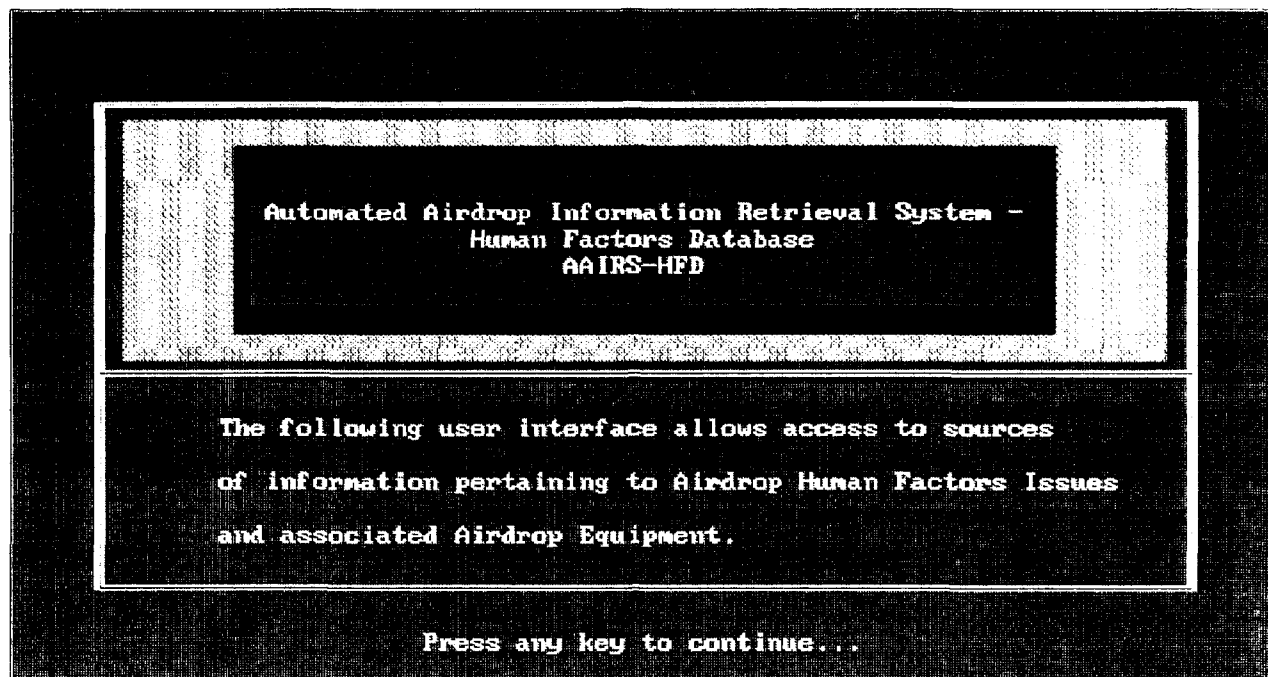


Figure 6. Welcoming screen for Natick's AAIRS-HFD.

Upon pressing any key, the system begins a working session with the main menu displayed and ready for use. Consult Section 4, Processing Reference Guide, for complete maintenance operating instructions.

3.3 Stopping and Suspending Work. The proper way to interrupt use of the system is to exit from the main menu by using the "Exit" option. **REBOOTING OR POWERING DOWN THE COMPUTER SHOULD NOT BE USED AS METHODS OF EXITING THE SYSTEM.** These methods do not shut down the system properly; they leave temporary files that should be deleted in the system directory. If this happens, subsequent use of the system will generate error messages. A list of error messages and suggested corrective actions is presented in Appendix D.

SECTION 4. PROCESSING REFERENCE GUIDE

4.1 Capabilities. The main menu offers a "Keyword Search" option, a "Text Search" option, a "Maintain System" option, and an "Exit" option. Selection of the Keyword Search option offers two types of searches: a Human Factors Issues Keyword Search and an Airdrop Systems/Components Keyword Search. Keyword searches run independently of one another and of text searches. After conducting either a keyword or a text search, a list of matching literature titles is displayed with options to view references and/or summaries on the screen, generate reference and/or textual output to a printer, or quit the search. Selection of the maintenance option allows updates to the source database, the Human Factors Issues databases and the Airdrop Systems/Components databases. Selection of the exit option closes the system, offers a backup option and returns the user to DOS. Instructions for keyword and text searches can be found in the User Manual for AAIRS-HFD (Poole et al., 1994).

4.2 Conventions. AAIRS-HFD was designed to run on a PC with a color monitor. Operation with a monochrome monitor is possible, but not desirable due to lack of contrast while using the system's menus and windows. The main color of the system is blue with contrasting red, yellow, cyan, and white graphics and text. A cursor, appearing as a white or yellow blinking underbar, usually is waiting for text input or another keystroke. The insert mode is automatically turned on at the beginning of each session, but it can be manually turned off by pressing insert (this will leave the computer in a "typeover" mode). Keystrokes required to operate the system include: **←**, **<Esc>**, **<Tab>**, **Delete**, **Backspace**, **↑ ↓ ↔**, **<PgUp>**, **<PgDn>**, **Home**, **End**, **<F2>**, **<F3>**, **<F4>**, and **<F10>**. The system can also be operated with a mouse. Traditional conventions for the mouse are used; position mouse cursor on menu item and click the pad. Some system options require the user to confirm or negate a selection. Usually, this is done with a yes or no response. Users can enter "y" for yes and "n" for no; any other keystroke is not accepted. On-screen

instructions are available throughout the system and generally appear at the bottom of a screen or popup menu.

When menus are accessed, the active option is denoted by a light bar which is a red rectangle with yellow text. Non-active menu options are presented in cyan text with no contrasting rectangle. Some of the system's menus employ the use of "hot keys." With hot keys, the user can press a key letter in the title of the menu option (usually the first letter) to perform the functions of multiple keystrokes. Hot keys appear in a different color and are used as a shortcut to both selecting and activating a menu item. Normally, without hot keys, the user would scroll to the desired menu option using \uparrow \downarrow , <PgUp> or <PgDn> and then press \leftarrow to activate it. Although hot keys are more efficient while actually using the system, for purposes of demonstration, the examples in this report utilize the arrow and return keys for selecting and activating options.

4.3 Processing Procedures. Instructions for all main and submenu options, with the exception of searches, are described below. Section 4.3.1 describes how to maintain the database system and Section 4.3.2 describes how to exit the system.

4.3.1 Maintaining the System. "Maintain System" is an option which allows maintenance personnel who have access to the password protected system to enter new records or modify existing records in any of the many databases that makeup AAIRS-HFD. The source database contains all reference information as well as assigned keywords and textual summaries. Reference information and assigned keywords are entered directly into the system using data entry screens and pop-up menus. Textual summaries are imported into the system using automated import techniques or they can be typed directly into textual memo fields. The human factors issues and airdrop systems/components keywords databases makeup the lists of keywords and their respective descriptions that are accessed when conducting a search or assigning keywords to literature entries.

To update AAIRS-HFD, highlight "Maintain System" on the main menu by using ← → and press ↵. Selection of this option will offer three update choices: Source Database, Human Factors Issue Databases and Airdrop Systems/Components Databases (see Figure 7).



Figure 7. Main menu with "Maintain System" selected.

4.3.1.1 Updating the Source Database. To update the source database, highlight "Source Database" under the "Maintain System" main menu option and press ↵. The system will then ask the user to confirm or negate the request. Upon negating the request for updating the source database, the user will be returned to the main menu. Upon confirming the request for updating the database, the user is required to enter the system password (see Figure 8). For purposes of security, the password is not documented in this manual, but it may be obtained from Natick personnel responsible for AAIRS-HFD. During password entry, text is not visible on the screen, but it registers with the system upon pressing ↵. The user is given three chances

to enter the correct password. If the user enters three incorrect passwords, control is sent to the main menu.

Required Search Text Search Maintain System EXIT

Source Database
Airdrop Systems/Components Databases
Human Factors Issues Databases

In order to enter or modify data that is stored in Natick's
AAIRS-HFD System, please enter required password and press <

Figure 8. Password entry screen.

Upon correct password entry, the system displays an "Update Duplication Check" screen (see Figure 9). The "Update Duplication Check" screen asks the user if the record is being entered or searched for by title or subtitle. Most records will be entered by title and first author, but some entries, such as chapters in edited books or papers presented at symposiums, may be required to be entered by subtitle and first author. As an example, the user may want to enter a new journal article entitled: "Motion Sickness and Anxiety", by Shaul Fox and Isaac Arnon. In order to do so, the user selects "T" for title and then follows the screen prompts for entering author and title text. The user is requested to enter the first initial, middle initial (if any) and last name of the first author. Additionally, they are requested to enter up to the first 60 characters of the title exactly as it is to be stored in the database. Table 2, presented in Section 4.3.1.1.1, Entering Reference Information, describes data entry

conventions for each database field. For this example, the user would enter "S. Fox" in the First Author field and the complete title in the title field because it is less than 60 characters (see Figure 9).

For entries such as edited books with independent chapters, the title may be duplicated in several records with different subtitles. For these entries select "S" for subtitle and the system will continue in a similar manner as when updating a title.

```
Update Duplication Check

Would you like to Edit/Append a report entered by
title or subtitle?
Enter  T for a title   or   S for a subtitle   T

Please Enter the First Author's Initials and Last Name:
S. Fox

Please Enter the First 60 Characters of the Report Title:
Motion sickness and anxiety.
```

Figure 9. Entering the first author and title text.

Based on user specifications, the system searches the source database to be sure that a record matching the user's specifications does not already exist. If a matching record is found, the system displays the entire record, including reference information, keywords, and textual summaries in four data entry screens. The user has the capability to edit information stored for the record. If there is more than one record that matches the user's specifications, all matching records are displayed, and the user is allowed to advance to a specific title of interest using <F10>. If the record is known to exist, the user may enter fewer than 60 characters for the title or subtitle

text as a shortcut. Caution should be used, however, due to the fact that many authors begin related titles of work with the same phrases.

If no matching records are found, as demonstrated by the example, the user is asked to confirm or negate the request for the addition of a new record to the database. Upon negating the request to add a new record, the user may either return to the main menu or continue updating. Upon confirming the request to add a new record, the system displays four entry screens for the new record (see Figures 10-13). Notice that information entered by the user at the beginning of the update session was automatically inserted into the new record. **IT SHOULD BE NOTED THAT MAINTENANCE PERSONNEL MAY FIND IT HELPFUL TO RUN A DUPLICATION CHECK EVEN BEFORE THEY REVIEW A PIECE OF LITERATURE SO AS TO AVOID DUPLICATION OF EFFORT.**

Screen 1 of 4

Title: Motion sickness and anxiety.

Subtitle:

Year: Month(s): Day: Volume: Page(s):

DTIC/NTIS #: Report #:

Organization:

Journal/Publisher:

Location of Source:

Type of Source:



 Press 
To Select
From Popup

Figure 10. First entry screen of a new record.

Screen 2 of 4

Textual Memo Fields

Summary: Comments:
Memo memo

<F3> To View Memo
 <F4> To Exit Memo
 <Ctrl> + <←> To Import Text

Author(s)/
POCs

Editor(s)

FI	MI	Last
1.	S.	Fox
2.	I.	Arnon
3.		
4.		
5.		
6.		

1.	
2.	
3.	

Figure 11. Second entry screen of a new record.

Screen 3 of 4

Human Factors Issues

- Airdrop Delivery Method
- Jump Mission Characteristics
- Airdrop Tasks & Procedures
- Personnel Parachuting Malfunctions
- Cargo/Resupply Airdrop Malfunctions
- Aerospace Biomechanical Factors
- Aerospace Physiological/Medical Factors
- Injuries/Illnesses

<←> to Select

<TAB> Next Field/Screen
<F10> Exit/Save Record

Human Factors Issues Keywords

▶no assignments

↓ ↑ To Scroll Assignments

Figure 12. Third entry screen of a new record.

Screen 4 of 4

Airdrop Systems/Components

Static Line Personnel Parachute Assembly

Military Free-Fall Personnel Parachute Assembly

Tandem Personnel Parachute System

Individual Equipment & Weapons Containers

Container Release Assemblies

Individual Protective/Life Support Equipment

Cargo/Resupply Parachute Assembly

Cargo/Resupply Container Systems

← to Select

<TAB> Return to Screen 1

<F10> Exit/Save Record

Airdrop Systems/Components Keywords

▶no assignments

↓ ↑ To Scroll Assignments

Figure 13. Fourth entry screen of a new record.

There are on-screen instructions to aid the user during both editing and appending update sessions. Detailed instructions for entering reference information, importing textual summaries, assigning/deleting keywords, exiting records and continuing with the update process are presented in the sections that follow.

4.3.1.1.1 Entering Reference Information. Most reference information can be typed directly into the data entry fields with the exception of two pop-up lists available for the source location and source type fields. Information typed directly into the data entry screens should be carefully edited. The pop-up lists displayed for the source location and source type fields will activate when the cursor is placed in the field and ← is pressed (see Figure 14). These menus are designed to simplify and standardize available choices. Pressing escape while the popup list is activated will leave the field empty. Pressing ← on screens one and two and <Tab> on screens three and four advances the cursor to the next field/screen. Pressing <F10> exits/saves the record. Table 2 displays data entry conventions for fields containing reference information.

Table 2. Data Entry Conventions for Reference Database Fields.

Database Field:	Entry Form:
Title/Subtitle	Enter up to 254 characters capitalizing only the first word of the title, proper names or labels within the title and the first word following any colons that are within the title.
Year	Enter four digit years only.
Month(s)	Enter three letter abbreviation for each month, capitalizing the first letter only. Indicate a range of months with a hyphen for a total of up to 7 characters.
Day	Enter digits for day. Indicate a range of days with a hyphen for a total of up to 5 characters.
Volume	Enter up to 5 digits, or if applicable, Roman numerals for volume.
Page(s)	Enter up to 12 digits for page numbers. Indicate a range of pages with a hyphen.
DTIC/NTIS #	Enter up to 25 characters and/or digits.
Report #	Enter up to 25 characters and/or digits.
Organization	Enter up to 254 characters, lower or upper case as necessary.
Journal/Publisher	Enter up to 254 characters, lower or upper case as necessary.
Authors/POCs/Editors	Enter all initials, each followed by a period and a space, then followed by last name for a total of up to 45 characters.

Screen 1 of 4

Title: Motion sickness and anxiety.

Subtitle:

Year: 1988 Month(s): Aug Day: Volume: 59 Page(s): 728-33

DTIC/NTIS #: Report #:

Organization: Department of Psychology, Bar-Ilan University, Ramat-Gan

Journal/Publisher: Aviation, Space, and Environmental Medicine

Location of Source: MANPRINT Office
Natick Technical Library

Type of Source: USARIEM
← to Select (Esc) for Blank

Press ←
To Select
From Popup

Figure 14. Example pop-up list for source type field.

4.3.1.1.2 Importing Textual Information. On the second data entry screen there are memo fields for an overall summary and comments (see Figure 15). The user may import text into these fields or text may be entered directly into the memo fields by opening the memo field and simply typing the desired text. Since FoxPro does not presently offer spell-checking for memo fields, the import method described below should be utilized for lengthy textual input.

Ideally, all textual summaries will be written using a word processor, such as WordPerfect or MultiMate, spell-checked and edited, converted to ASCII format with a ".txt" file extension, and temporarily stored in a directory on the hard drive. Temporary storage of text summaries on the hard drive is suggested so that the files are readily accessible to the import module of the system. Instructions call for the user to press **Ctrl** + ← to activate the import module window (see Figure 15). The user is then asked to confirm or negate the import request. Upon negating the request, the user is simply returned to the second screen of the update session. Upon confirming the import request, the user is prompted to enter the file name and

extension of the file requiring importation. If summaries are stored in a location other than the AAIRS-HFD directory, the user is required to type in the drive and path name in addition to the file name and extension during the import process. The current example has a summary, but no comments. To import the summary, place the cursor on the summary field and press **←**. The ASCII text file for this record is called "sum033.txt" and is stored in a directory called "c:\wp51\docs." Therefore, enter "c:\wp51\docs\sum033.txt" and press **←** (see Figure 15). If the path is entered incorrectly, or if there is a typographical error in the file name or extension, the system will display an error message.

Screen 2 of 4

Textual Memo Fields

Summary:	Comments:
memo	memo

<F3> To View Memo

<F4> To Exit Memo

<Ctrl> + <←> To Import Text

Enter file name and extension
(include path if file is not located in the
AAIRS directory): c:\wp51\docs\sum033.txt

Figure 15. Import module window.

Once a valid path (if necessary) and filename and extension have been entered, the system imports the contents of the ASCII text file into the specified field. Using this method to import a text file overwrites any existing data stored in the memo field. Note that memo fields display the word "memo" as a type of place marker. Capitalization of the first "M" in the word "Memo" denotes some type of textual

contents, whereas all lower case letters denote an empty field. The capitalization of "M" in the word "Memo" occurs automatically after information is added and the memo field is closed. It should be noted that control characters such as those used for superscripts and subscripts in WordPerfect or MultiMate may not convert to ASCII format properly. Substituting control characters with convertible text is suggested. Superscripts should be substituted with the "^" character and subscripts should be eliminated. Maintenance personnel should make note of any unconvertible control characters not already mentioned. It is advisable to do so directly on this page of the maintenance manual. Once the summaries have been imported into AAIRS-HFD, they should be deleted from the hard drive, but kept on floppy diskettes for long term storage.

4.3.1.1.3 Assigning/Deleting Keywords. Human Factors Issues keywords and Airdrop Systems/Components keywords are assigned and/or deleted on the third and fourth data entry screens, respectively (see Figures 16 and 17). On these screens, **←** , **↑ ↓** and **<Esc>** are used for the selection and assignment of keywords and **<Tab>** is used to advance to the next field or screen. Procedures for assigning and deleting each type of keyword are identical. Therefore, for instructional purposes, only the Human Factors Issues keyword assignment procedures are presented below.

Firstly, it is important to note that the number of keywords assigned to each record is limited only by available hard disk space. Hard disk space, however, is not likely to be a concern due to the fact that minimal space is required for each keyword assignment. Keywords are organized by major topics. A list of major topics is presented for the user to view. For example, to assign the keyword "Psychological Stress" to the example record, the user must first select "Psychological Factors" from the Human Factors Issues major topics list and then press **←** . Upon pressing **←** , the user is offered a pop-up list of Psychological Factors keywords. The desired keyword can be highlighted by scrolling with **↑ ↓** (see Figure 16).

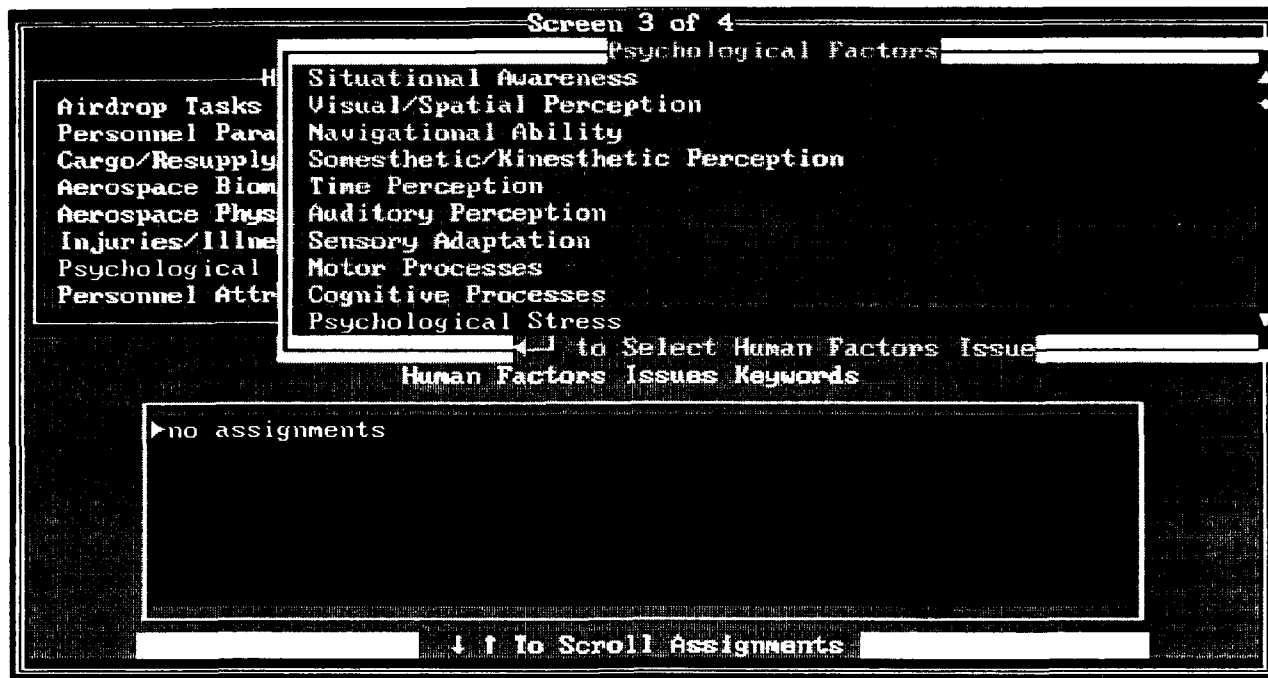


Figure 16. Selecting a keyword for assignment.

In order to assign the keyword, press ←, which in turn displays a confirm/negate window. The user is asked to confirm or negate the assignment/deletion of the selected keyword. The system checks the current record's keyword assignments. If the selected keyword has not yet been assigned to the record, confirming the request will add the keyword to the record as a new assignment and negating the request will simply return the user to the keyword list with no new assignments made. If the selected keyword has already been assigned to the record, confirming the request will delete the assignment if an additional confirm/negate request is affirmed and negating the request will leave the assignment intact and return the user to the list of keywords (see Figure 17).

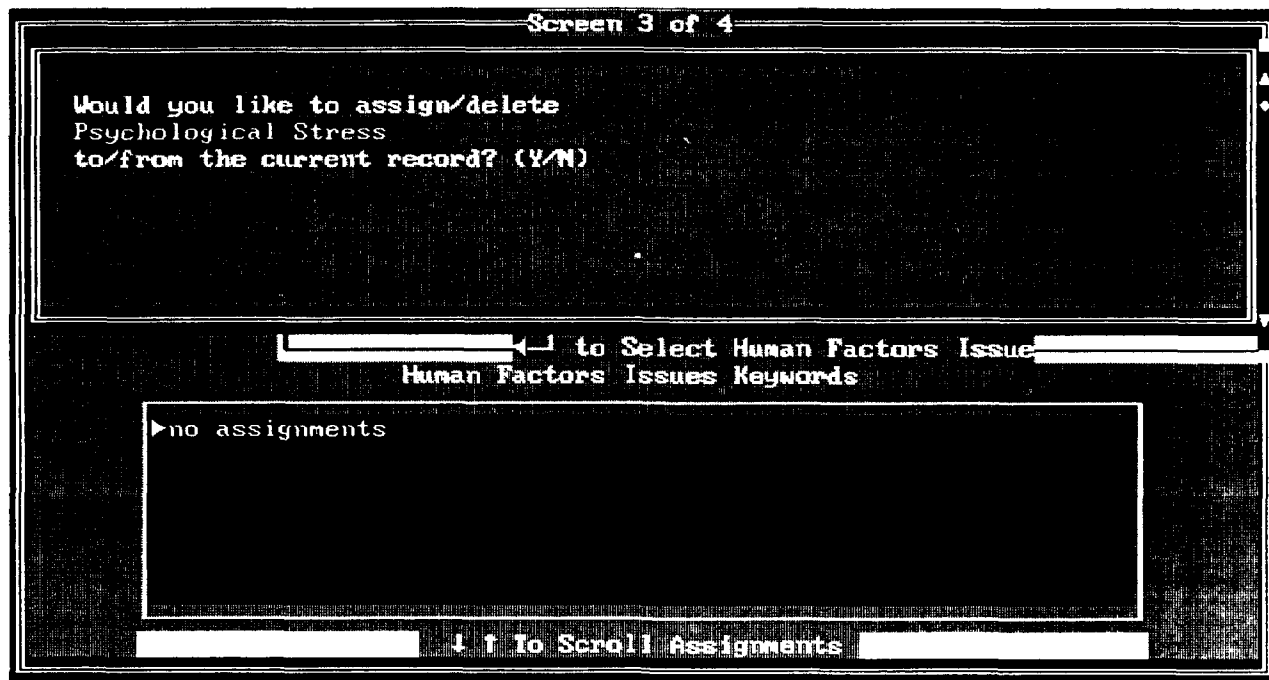


Figure 17. Confirming/negating the assignment/deletion of a keyword.

Maintenance procedures call for the upkeep of master keyword lists called taxonomies. Taxonomies for both Human Factors Issues and Airdrop Systems/Components are presented in Appendix A. These taxonomies represent major topics and keywords, and when available, detailed descriptions of keywords. These taxonomies should be maintained to reflect current choices available in the database. Careful review of these taxonomies should help identify keywords that best represent the record being entered.

If there is a major topic or concept of the article/book that is left unaddressed by the currently available keywords, maintenance personnel may declare a new keyword. The new keyword may be added to one or more of the major topics keyword lists. The procedure for adding new keywords is described in Section 4.3.4.2, Adding New Keywords.

4.3.1.1.4 Exiting a Record/Continuing with Update Session. When the user is finished with a record, pressing **F10** will exit and save the record. The system then displays a question asking the user to confirm or negate a request to continue updating (see Figure 18). If the request to continue updating is negated, the user is returned to the main menu. Confirmation of the request to continue updating, starts the whole entry process over again starting with a new "Update Duplication Check" screen as displayed in Figure 9. The user then continues updating as described above. If maintenance calls for the entry of ten or more records at a time, it is highly recommended that the user periodically exit the system by normal means and start a new update session to avoid the possibility of losing data in the event of a computer or power failure.

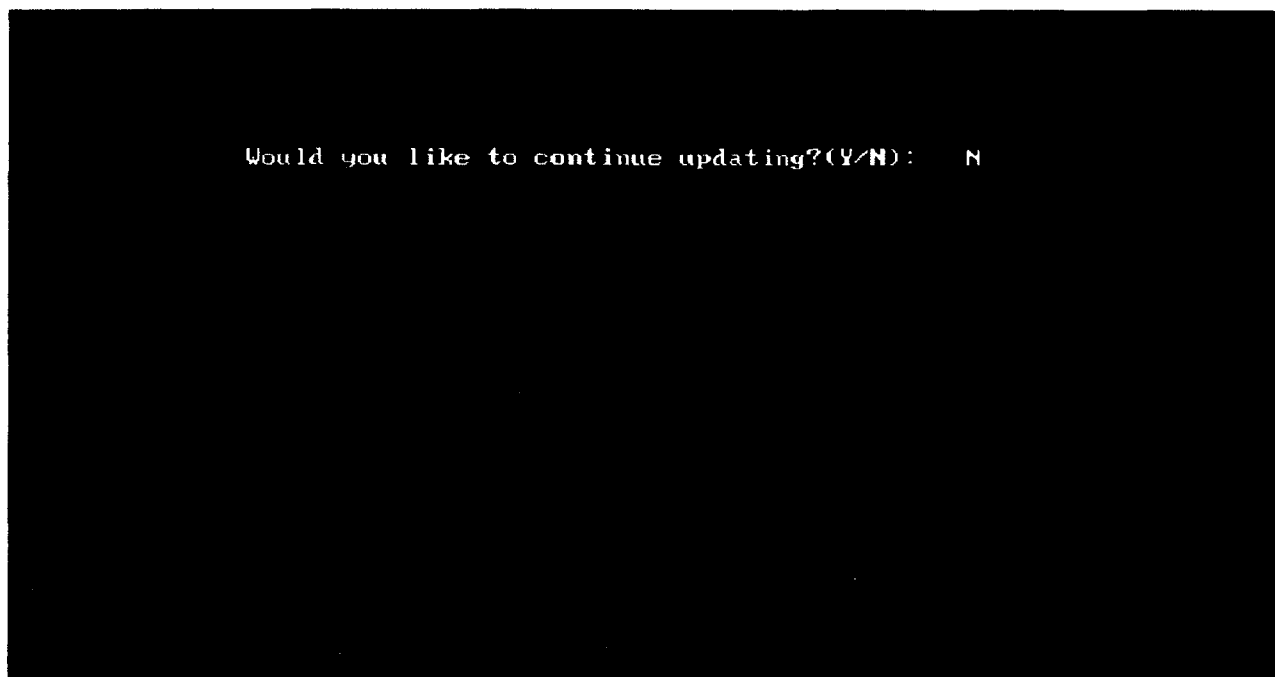


Figure 18. Confirming/negating the request for continuing updating.

4.3.1.2 Updating the Keyword Databases. There are two major types of keywords: Airdrop Systems/Components keywords and Human Factors Issues keywords. Furthermore, each of these types of keywords is categorized into major topics. Each major topic has an associated database that stores keywords and keyword descriptions. Examination of the taxonomies in Appendix A, will reveal major topics to be numbered, appearing in bold text that is flush with the left margin. Keywords are positioned under major topics in regular upper and lower case text that is flush with the left margin. Keyword descriptions (if present) are in lower case text that is indented under keywords. Descriptions may include several "tiers" of indents, with each successive indent being more specific. The number of keywords per major topic varies. In addition, the presence of keyword descriptions is determined on a "need be" basis. For example, some keywords are self explanatory and stand alone, whereas others may offer further descriptive terms that are intended to aid users in the keyword selection process while conducting keyword searches. It is the responsibility of maintenance personnel to upkeep these keyword databases.

The maintenance module of AAIRS-HFD allows maintenance personnel to add, edit and delete keywords and keyword descriptions. Procedures for updating each type of keyword are identical. Therefore, for instructional purposes, only the Human Factors Issues keyword updating procedures are presented below.

To update one of the Human Factors Issues databases, highlight "Human Factors Issues Databases" under the "Maintain System" main menu option and press **↵** (see Figure 8). The system will then ask the user to confirm or negate the request. Upon negating the request for updating the Human Factors Issues databases, the user will be returned to the main menu. Upon confirming the request for updating the databases, the user is required to enter the system password (see Figure 19). For purposes of security, the password is not documented in this manual, but it may be obtained from Natick personnel responsible for AAIRS-HFD. During password entry, text is not visible on the screen, but it registers with the system upon pressing **↵**. The user is given three chances to enter the correct password. If the user enters three incorrect passwords, control is sent to the main menu.

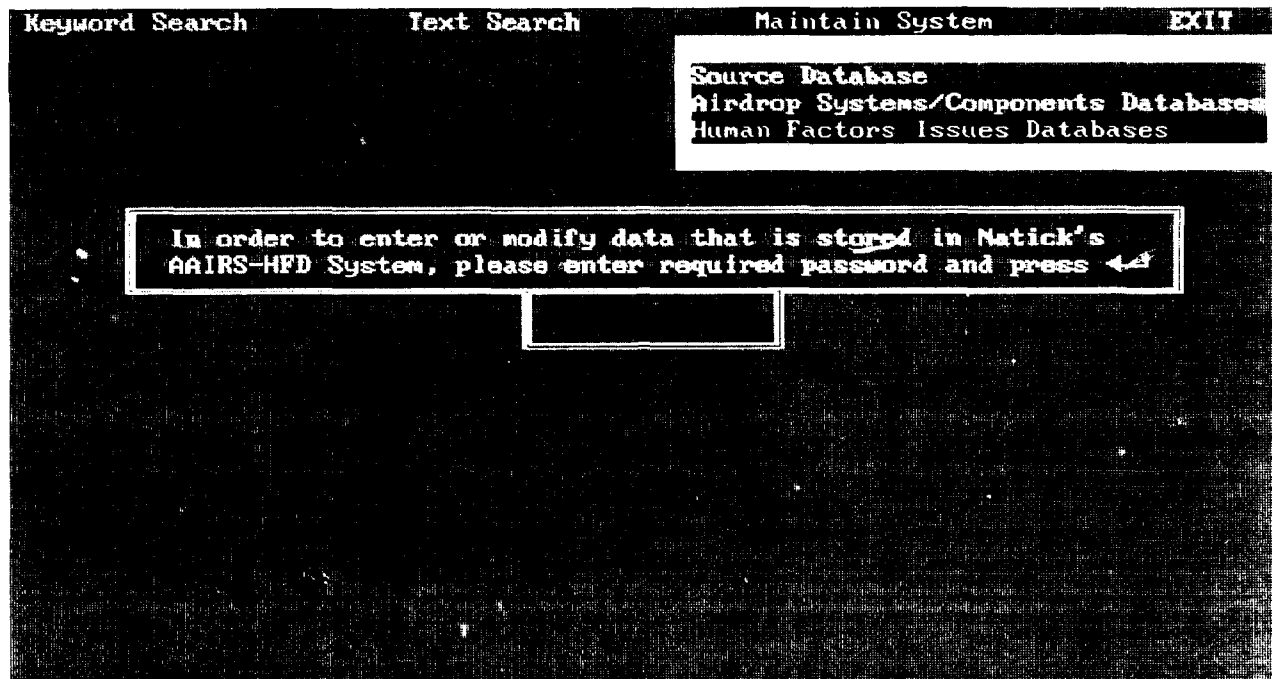


Figure 19. Password entry screen.

Upon correct password entry, the system displays a menu of major topics available under Human Factors Issues (see Figure 20). A major topic can be highlighted using \uparrow \downarrow and selected by pressing \leftarrow . Upon selection of a major topic, the contents of the associated database is displayed. The keyword field is listed on the left-hand side of the screen and the description memo field on the right (see Figure 21). Description memo fields are hidden textual fields that display the word "memo" as a type of place marker. Capitalization of the first "M" in the word "Memo" denotes some type of textual contents, whereas all lower case letters denote an empty field.

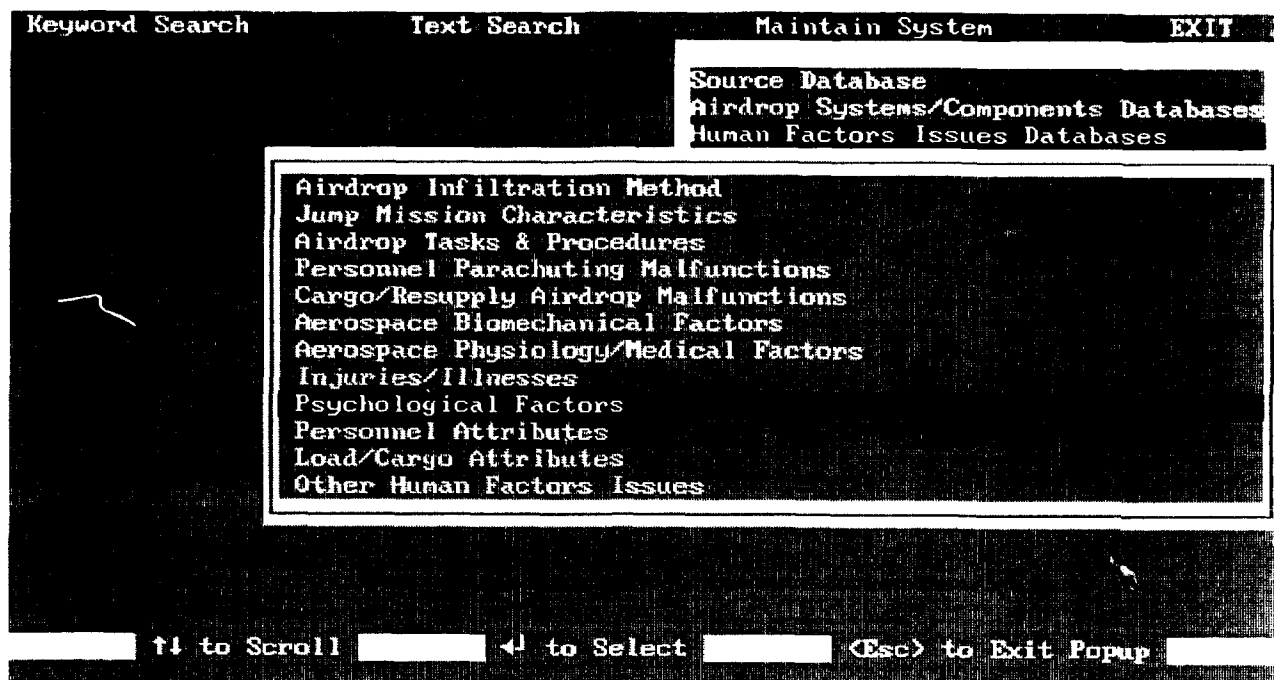


Figure 20. A list of Human Factors Issues major topics.

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Psychological Factors	Description
Visual/Spatial Perception	Memo
Navigational Ability	Memo
Somesthetic/Kinesthetic Perception	Memo
Time Perception	Memo
Auditory Perception	Memo
Sensory Adaptation	Memo
Motor Processes	Memo
Cognitive Processes	Memo
Psychological Stress	Memo
Psychological Measurements	Memo

↑↓ to Position Highlight Bar for Insert/Edit/Delete <F2> for Options

Figure 21. Contents of a keyword database.

Pressing **↑ ↓**, **<PgUp>**, and **<PgDn>** allows the user to scroll the list of keywords and position the highlight bar for insert, edit or delete options. Pressing **<F2>** presents the user with a menu of options. This menu allows the user to: insert a new keyword before the currently highlighted keyword; insert a new keyword after the currently highlighted keyword; edit an existing keyword, delete a keyword, return to the list of keywords and quit the update (see Figure 22). Each of these are described in the sections that follow.

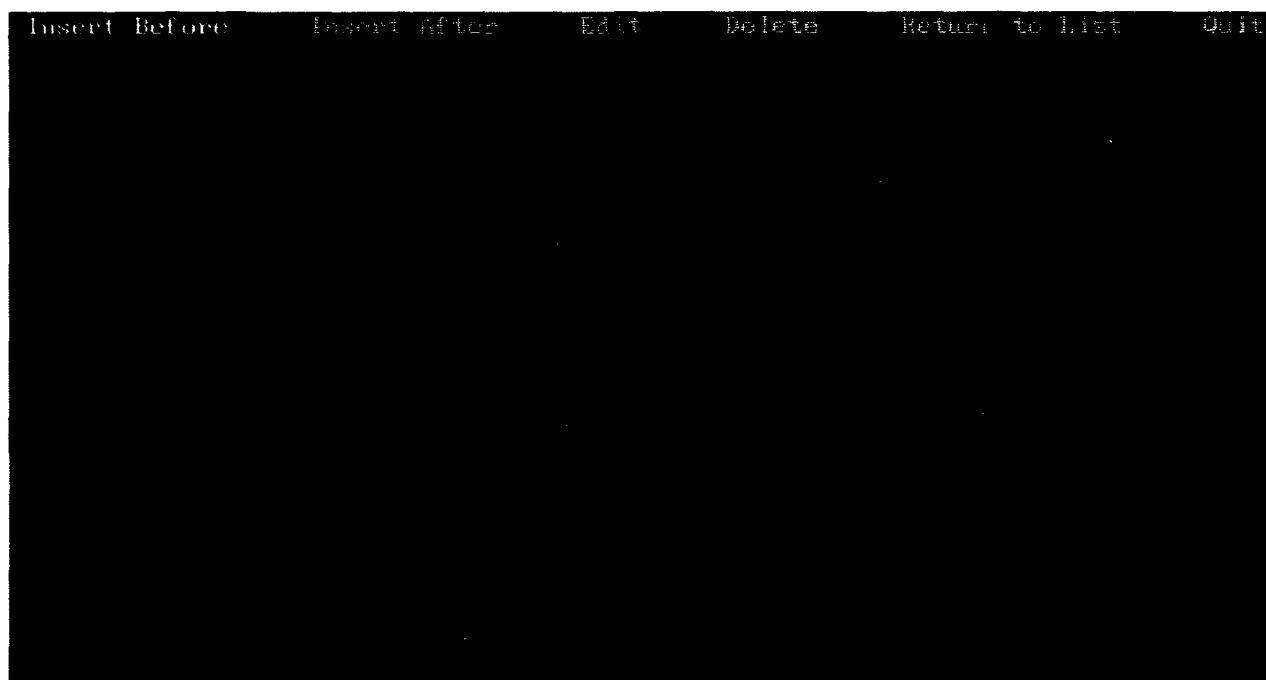
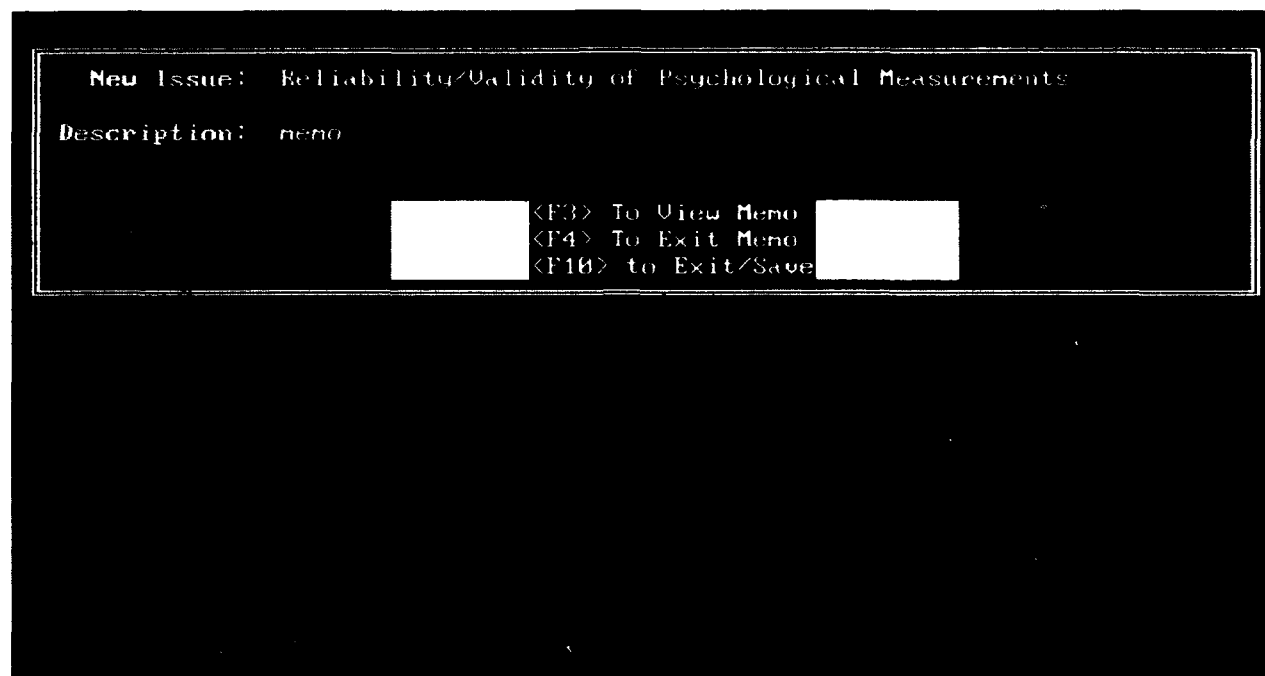


Figure 22. Keyword database maintenance options.

4.3.1.2.1 Adding New Keywords and Descriptions. In order to add a new keyword to an existing list, it is first necessary to be sure that the highlight bar is positioned according to where the new keyword is to be placed. New keywords can either be placed before or after the highlight bar. For example, if a new keyword is desired after the highlight bar, simply highlight "Insert After" and press **↵**. The system then displays one screen in which the user can enter a new keyword and, if applicable, a keyword description (see Figure 23). New keywords are limited to 60 characters and

can be typed directly into the keyword field. As an example, the new keyword, "Reliability/Validity of Psychological Measurements" can be typed into the field labeled "New Issue" (see Figure 23).



New Issue: Reliability/Validity of Psychological Measurements

Description: memo

<F3> To View Memo

<F4> To Exit Memo

<F10> to Exit/Save

Figure 23. Data entry screen for new keywords.

Keyword descriptions are only limited by available hard disk space, but they must be typed in a memo field which requires an additional keystroke to open **<F3>**, and another to close **<F4>**. Figure 24 displays an open memo field. The example new keyword, however, does not require a description.

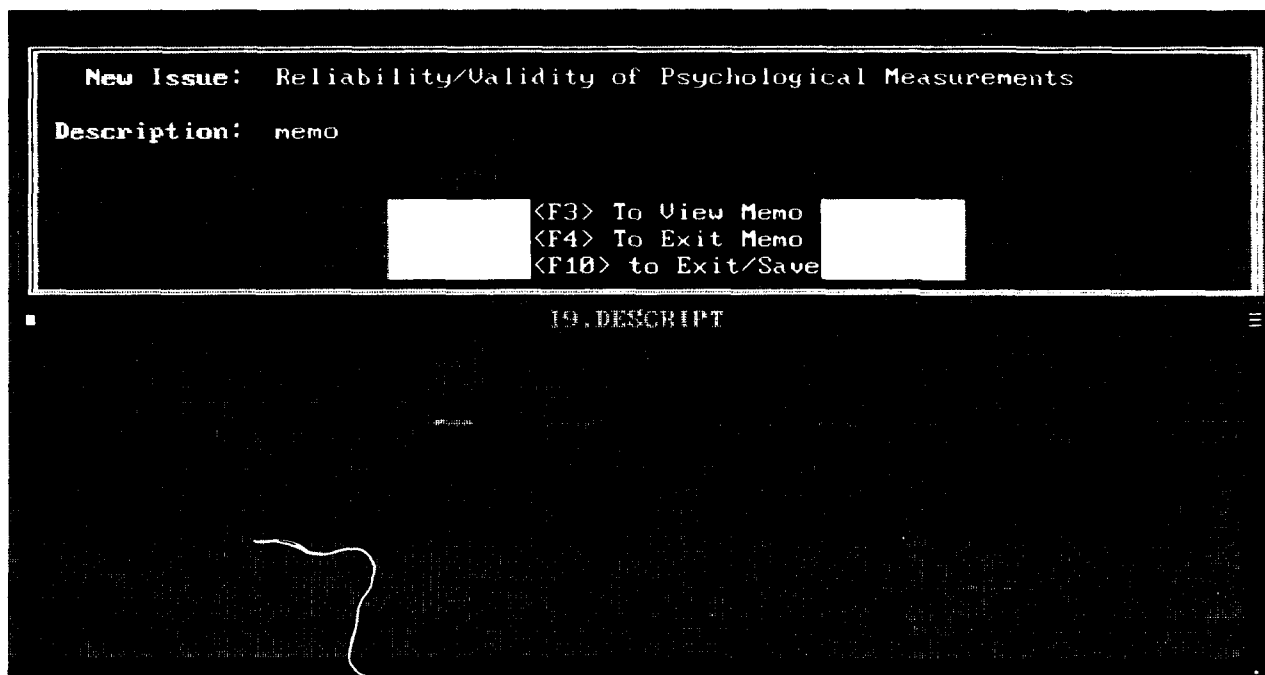


Figure 24. Data entry screen for new keywords with an opened memo field.

The format for keyword descriptions is demonstrated in the keyword taxonomies presented in Appendix A. Descriptive terms are listed in a tiered format, with each indented level being more specific. Once again, the memo field can be exited by pressing **<F4>**. Pressing **<F10>** exits and saves the new keyword and the keyword description. The user is returned to the updated list of keywords, showing the new keyword inserted after the highlight bar. It should be noted that the system behaves exactly the same when the "Insert Before" option is selected with the exception of the new keyword's placement in the list.

4.3.1.2.2 Editing Existing Keywords and Descriptions. In order to edit an existing keyword or its respective description, the user must first position the highlight bar on the keyword requiring modification and then press **<F2>** for options (see Figure 21). The user then highlights the "Edit" option using **←→** and presses **↵** (see Figure 22). The system displays a screen similar to that shown in Figure 23, with the currently highlighted keyword displayed

for modification. From here, the system behaves as described in the preceding section for adding new keywords.

4.3.1.2.3 Deleting a Keyword and Description. Prior to deleting a keyword and its description from a keyword list, it is imperative that maintenance personnel first check the entire database for entries that may already have been assigned the keyword that is targeted for deletion. This crucial step is necessary so that individual records can be cleaned up and, if necessary, have new keywords assigned to them. Basically, maintenance personnel should follow these steps when a keyword is being considered for deletion: 1) generate a search for the keyword to be deleted, 2) generate a printed report of the results of step 1, 3) add new keyword(s) (if any) to appropriate keyword list(s), 4) edit each individual record found in the report that was generated in step 2, deleting and adding keyword assignments as necessary, and 5) delete keyword and its description from keyword list.

In order to delete a keyword along with its associated description, the user must first position the highlight bar on the keyword requiring deletion and then press <F2> for options (see Figure 21). The user then highlights the "Delete" option using ← → and presses ↵ (see Figure 22). The system then confirms the user's request to delete a keyword and its description. The keyword is displayed with the option of confirming or negating the request (see Figure 25). Confirming the request deletes the keyword from the active database and returns the user to the updated list of keywords. Negating the request returns the user to the intact list of keywords.

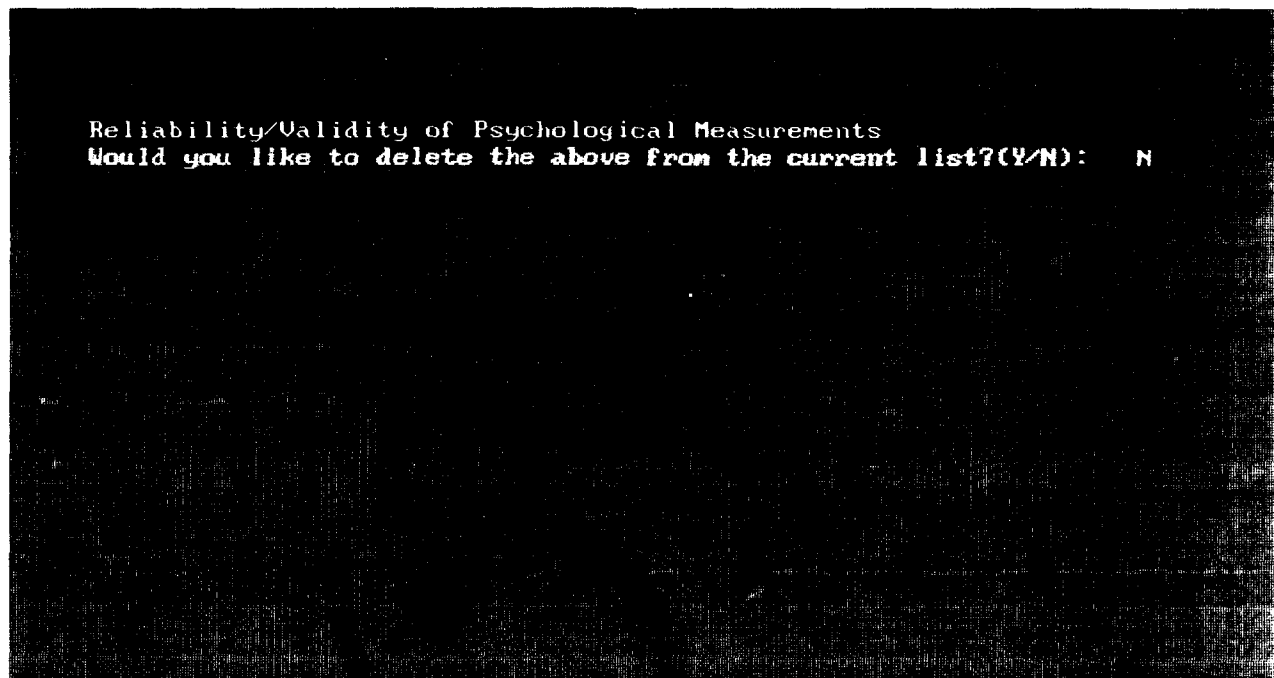


Figure 25. Confirming/negating the deletion of a keyword.

4.3.1.2.4 Returning to the List of Keywords. One of the keyword database maintenance options is called "Return to List" (see Figure 22). The user may return to the list of keywords by selecting the "Return to List" option using $\leftarrow \rightarrow$ and pressing \leftarrow . This option is useful for repositioning the highlight bar in the list of keywords or for simply reminding the user of its current position.

4.3.1.2.5 Quitting the Keyword Update. In order to end a keyword update session, select the "Quit" option using $\leftarrow \rightarrow$ and press \leftarrow (see Figure 22). Quitting a keyword update session returns the user to the list of major topics appearing at the start of the session (see Figure 20).

4.3.2 Exiting the System. In order to exit to DOS, highlight the "EXIT" option on the main menu using $\leftarrow \rightarrow$ and press \leftarrow (see Figure 26). **THIS METHOD IS THE ONLY PROPER WAY TO EXIT THE SYSTEM.** Exiting the system by any other method, such as soft booting or powering down the system, will result in error messages during

subsequent operation of the system. Assistance for dealing with such messages is located in Appendix C.

Upon accepting the "Exit to DOS" menu option, the system allows the user to automatically backup modified files onto floppy diskettes. Instructions for doing so are presented below along with descriptions of what the automatic backup accomplishes. It should be noted that this backup procedure is designed to backup only parts of the system that are modifiable. Backups are made onto diskettes already containing the files being updated. When necessary, a complete copy of the system can be made using the DOS COPY or DISKCOPY commands.



Figure 26. Exiting the system.

Initially, the system displays a question asking the user whether or not to backup the system (see Figure 27).

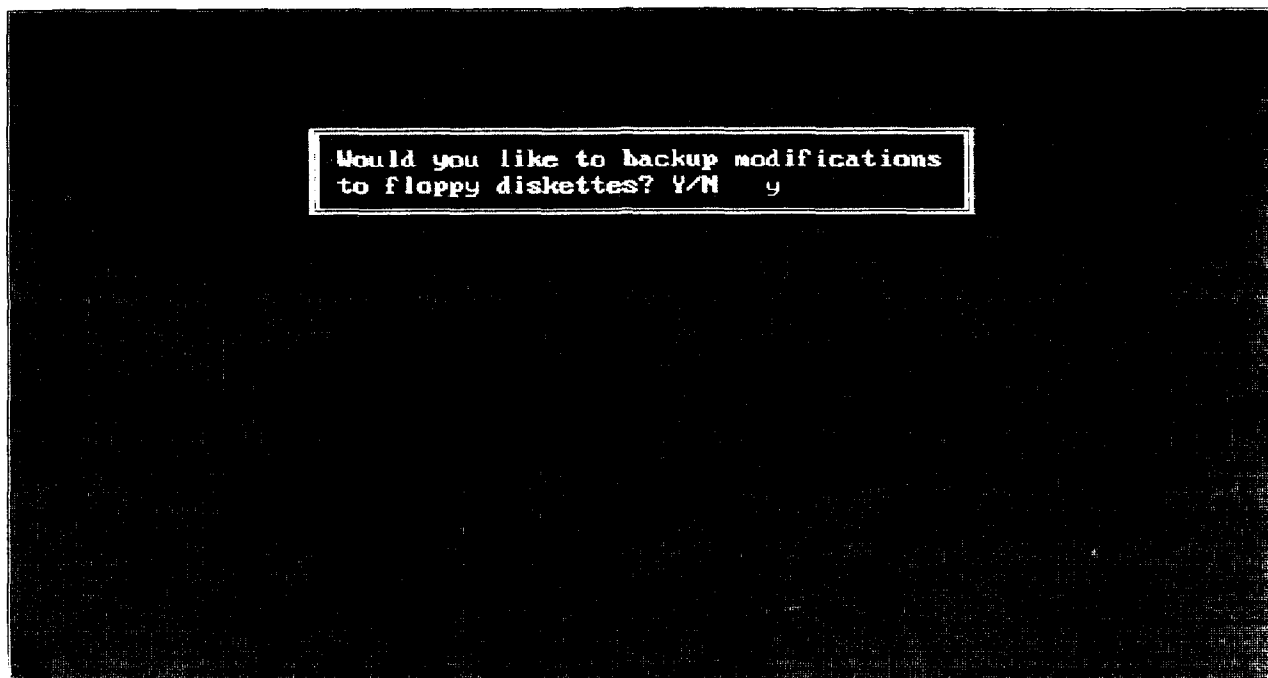


Figure 27. Confirming the start of a backup session.

Negating the request for backup continues normal shut down procedures and, within a few seconds, the user is returned to the DOS prompt. Upon confirming the request for backup, the system displays a screen asking the user to enter the drive designators that represent the computer system in use. The user enters the hard drive on which the system is installed and the floppy drive to which the system is to be copied (see Figure 28).

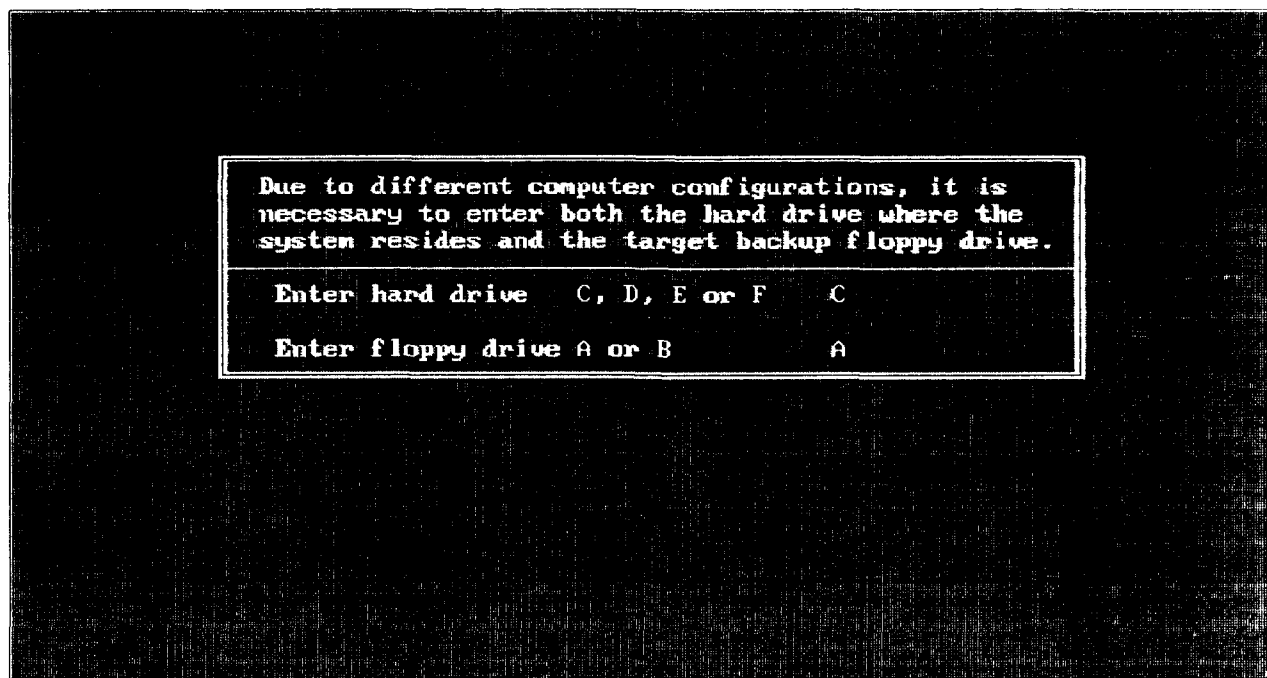


Figure 28. Entering hard and floppy drive designators.

The following floppy diskettes are required for backup procedures: the Keywords Diskette, the Source Diskette(s), and the Relations Diskette(s). It may be necessary to have extra formatted floppy diskettes on hand if the Source or Relations files have grown to a size requiring additional storage space since the previous backup was performed. Sequential labels for additional diskettes are stored with the backup software for AAIRS-HFD.

Upon entering the hard and floppy drive designators, the system prompts the user to insert the Keywords Diskette and to press \leftarrow (see Figure 29). Inserting the wrong diskette will repeat the prompt for the correct diskette. When the correct diskette is inserted, all files that make up the system's major topics keywords lists and keyword descriptions are copied onto the Keywords Diskette.

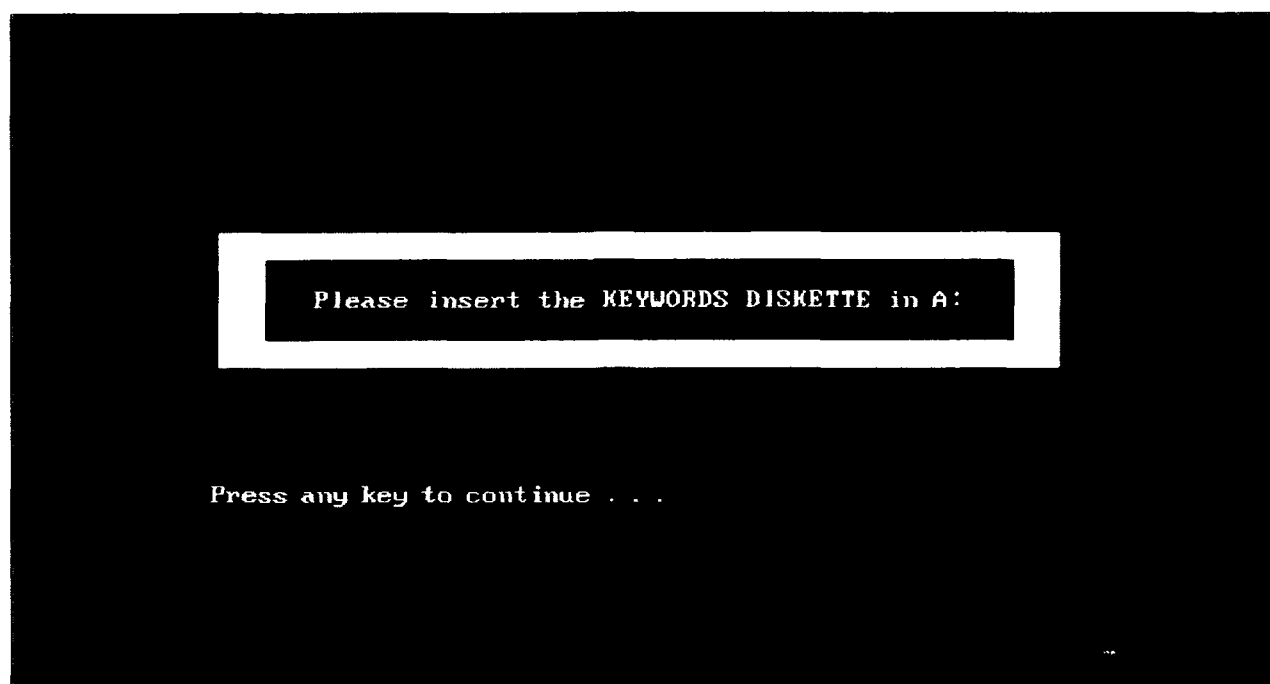


Figure 29. Backing up the Keywords Diskette.

Next, the user is prompted to enter the first diskette in the series of Source Diskettes (see Figure 30). With this diskette in place, the user presses any key to continue. DOS then takes over and prompts the user to insert the first backup diskette with a message similar to: "Insert backup diskette 01 in drive A: Warning! Files in the target drive A:\root directory will be erased. Strike any key when ready." Because the user has already inserted the first diskette, the first part of this DOS prompt can be ignored. Upon pressing any key to continue, DOS erases the floppy diskette and proceeds to backup the appropriate files. If the files do not fit on one diskette, another will be prompted for. Next, the user is prompted to backup the Relations Diskette(s). This is done in a similar manner as the Source Diskette(s).

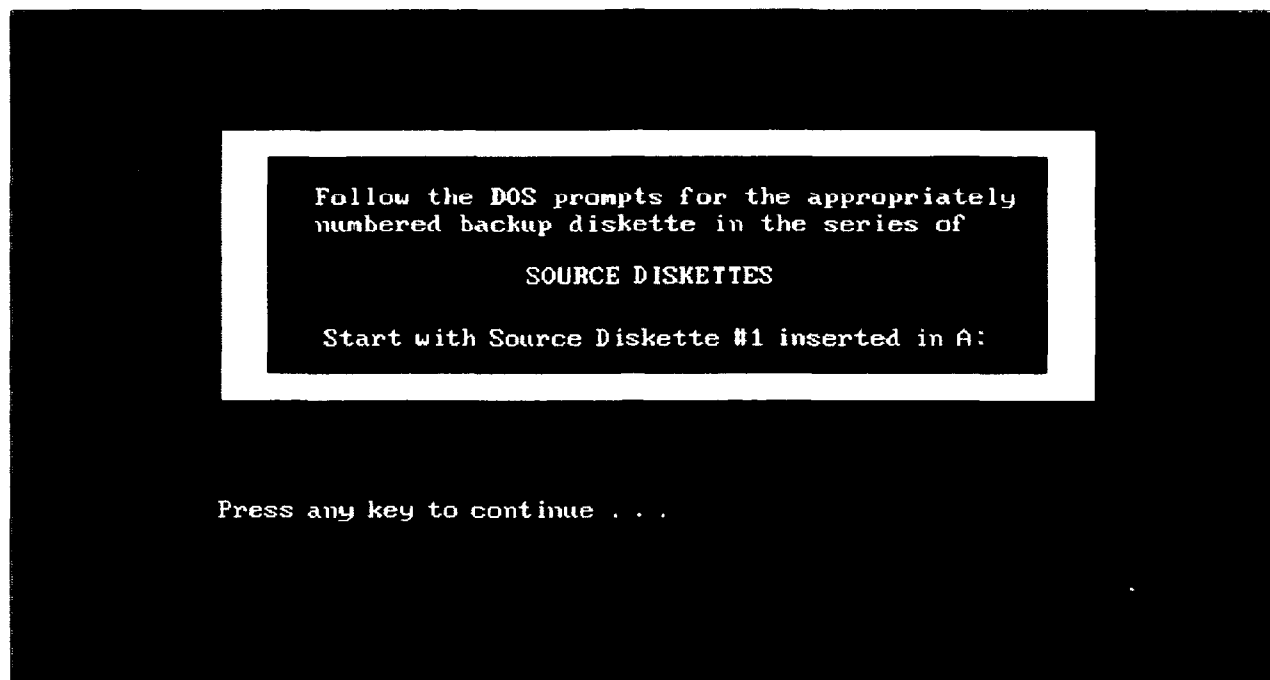


Figure 30. Backing up the Source Diskette(s).

Backup files stored on the Source and Relations Diskettes are the same names, but contain different information. Therefore, the backup procedure does not recognize the difference between Source Diskette #1 and Relations Diskette #1, but does recognize any other incorrect diskette. Part of the DOS backup command calls for the target diskette, in this case the floppy diskette, to be erased before a file is backed up. **INSERTING AN INCORRECT DATABASE OR TEXT DISKETTE #1 MAY ERASE AND SUBSEQUENTLY BACKUP A FILE TO THE WRONG DISKETTE.** If this mistake occurs, simply run the backup procedure again, paying careful attention to the series of diskettes being backed up. On-screen prompts are displayed readily at the start of each backup series and diskettes are clearly labelled to help alleviate this potential problem.

Upon completion of the backup, the system continues with normal shut down procedures and, within a few seconds, the user is returned to the DOS prompt with a message displayed as in Figure 31.



Natick's AAIRS-HFD was successfully backed-up.

Figure 31. A successful backup of AAIRS-HFD.

SECTION 5. CONCLUSION

It has been the authors' goal to provide a maintenance manual that offers an overall summary of the database including a project background as well as a comprehensive processing guide with detailed, step-by-step instructions and graphical screen representations. At the time this manual was published, Natick's Automated Airdrop Information Retrieval System - Human Factors Database included approximately 50 literature entries. It is still early in the stages of database development. However, review and entry of literature is continuing. As the database expands and the number of users increases, feedback from these users may necessitate further programming enhancements. Enhancement will be documented as manual supplements.

This document reports research undertaken at the U.S. Army Natick Research, Development and Engineering Center and has been assigned No. NATICK/TR-44/032 in the series of reports approved for publication.

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Poole, P. M., Kronberg, M. S. and Meyers, D. (1994). User Manual for Natick's Automated Airdrop Information Retrieval System - Human Factors Database (AAIRS-HFD) (Tech. Rep. NATICK/TR-94/033). Natick, MA: U.S. Army Natick Research, Development and Engineering Center.

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Appendix A:
Taxonomies of Human Factors Issues and
Airdrop Systems/Components

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A. Taxonomy of Human Factors Issues

1. Airdrop Delivery Method

- Military Free-Fall (MFF) Parachuting
 - high altitude low opening (HALO)
 - high altitude high opening (HAHO)
- Static Line Parachuting
 - conventional
 - nonconventional
- Personnel Non-Aerodynamic Decelerator
 - fast rope
 - rappelling
- Non-Intentional Parachuting
 - ejection seats/escape systems
 - crew capsules
- Platform Airdrop
 - low velocity platform airdrop (LVAD)
 - low altitude parachute extraction (LAPE)
- Container Airdrop
 - container delivery system (CDS)
 - high speed aerial delivery container (HISAC)
- Special Operational Forces (SOF) Load
- Door Bundle
- Free Drop

2. Jump Mission Characteristics

- Combat-Related Personnel Airdrop
 - mass assault
 - non-conventional mission
- Training-Related Personnel Airdrop
 - basic training
 - new equipment training
 - sustainment/refresher training
- Test & Evaluation-Related Personnel Airdrop
- Search & Rescue/Relief-Related Personnel Airdrop

- Combat-Related Cargo Airdrop
 - specialized mission
- Training-Related Cargo Airdrop
 - new equipment/rigging training
 - sustainment/refresher training
- Test & Evaluation-Related Cargo Airdrop
- Disaster/Humanitarian Relief Cargo Airdrop
- Duty Personnel Proficiency
- Departure Airfield
- Wing Flying Mission
- Time of Jump Mission
 - day
 - night
 - dawn
 - dusk
- Drop Altitude
 - low
 - high
- Altitude of Parachute Opening
- Jumper/Load Exit
 - number of jumpers/loads per aircraft
 - number of aircraft passes
 - number of jumpers/loads per pass
- Aircraft Speed
- Aircraft Variables
 - angle of aircraft approach
 - exit location
 - door
 - ramp
 - aircraft shape/aerodynamic flow
 - static line hook-up capability
 - oxygen prebreather for high altitude
 - ease of communication among troops
 - coordination of joint Army/Air Force responsibilities
 - time-in-flight
 - frequency of in-flight refueling

- in-flight environment
 - temperature/humidity
 - illumination level
 - seating capacity/crowding
 - noise level
 - flight pattern (e.g., nap of the earth)
 - food service capability
 - sanitary/waste management facilities
- aircraft type
- tail #

Environmental Conditions

- wind speed/wind shear
- wind direction
- winds aloft
- temperature
- barometric pressure
- precipitation/humidity
- visibility conditions/illumination level

Drop Zone Variables

- drop zone size
- drop zone elevation
- slope/grade
- terrain/topography
 - blacktop
 - rocks
 - dirt/dirt road
 - loose sand
 - light brush
 - heavy brush/trees
 - hard packed snow
 - soft snow
 - swampy bog/mud
 - water
- drop zone hazards/obstructions
 - wires
 - buildings
 - vehicles
 - other obstructions (lights, planes, poles, fences)
- troop assembly method
- assembly aids
- troop dispersion on DZ
- communications capability

Level of Risk

- unacceptable
- undesirable
- acceptable with review
- acceptable without review

3. Airdrop Tasks & Procedures

Maintaining Equipment

Rigging, Packing and Installing

- parachute inspection
- rigger checks
- time to complete tasks
- complexity of system
- familiarity with system
- similarity to other systems
- availability of rigging equipment
- parachute repacking cycle frequency
- repairs/maintenance procedures
- preparing automatic opening device
 - main or reserve mounted
 - accessibility
 - placement on harness
 - method of arming (e.g. pin)
 - unit of measure to set altitude
 - method/ease of calculating set altitude
 - method of test chambering AOD prior to use
- preparing oxygen supply system
 - bottle placement
 - hose routing
 - protection from accidental ignition
- preparing cargo loads
 - securing straps and webbing
 - preparing skids
 - load weight computations
 - preparing platform
 - positioning covers and honeycomb
 - stowing the load
 - marking the load

Pre-Exit Procedures

- computing airdrop release points
- jumpmaster inspection
 - on ground vs. in-flight
 - parachutes
 - rucks/individual equipment
- static line inspection
- bundle inspection
- spotting the drop zone
- jump commands

Aircraft Exit

- location of exit door/ramp
- door/ramp configuration
- body posture/rigidity (including head-chin tuck)
- equipment/weapons container interference
- method retrieving hung/towed jumper

Free-Fall

- executing the count sequence
- tumbling/somersaulting/spinning upon exit

Main/Reserve Canopy Opening

- planned opening altitude
- method of canopy activation
 - automatic activation
 - static line
 - automatic opening device
 - familiarity with use
 - mode of operation (how it is actuated)
 - compatibility with altimeter
 - altimeter display
 - manual activation
 - ripcord release
 - ripcord handle type
 - ripcord handle placement
 - pullforce required
- method of canopy deployment
 - sleeve
 - bag
 - diaper
- cutaway method for main canopy

Canopy Descent

- canopy control
 - check canopy
 - correcting suspension line twists
 - steering the canopy
 - performing slips
 - performing turns
 - collision/entanglement avoidance
 - correcting body posture/rigidity/stability
 - aerodynamic influence of equipment/weight
- use of oxygen
 - on/off activation method
 - mask fit

Landing Preparation

- equipment release
 - method
 - number of attachment points
- lowering equipment
 - lowering time
- turning into the wind
- flaring

Landing

- parachute landing fall (PLF)
- attitude/body position
- impact speed

Post Landing

- canopy control
- collapsing the canopy
- releasing canopy
- recovering and stowing canopy

Derigging Cargo Loads

- securing drop zone
- recovery priorities
- recovery techniques
- evacuation method

Availability of Technical Manuals

Availability of Material Handling Equipment/Tools

- load preparation/assembly
- load recovery/derigging

4. Personnel Parachuting Malfunctions

Rigging/Packing Errors

Pre-Exit Errors

- unintentional parachute opening in airplane
- aircraft equipment contributing to accident/error
- airplane crash with parachutist aboard
- anchor cable/retriever system
- jump platform
- air deflector
- rails/rollers
- seats/stanchions
- space/mobility constraints
 - inability to see/adjust equipment
 - awkward movement to door
- miscalculated release point

Exiting Errors

- improper exit
 - poor door position
 - dragged equipment
- dangling static line
- misrouted static line
- jumper/load strikes aircraft
- hung/towed jumper/load
- midair collision with airplane
- poor body position during canopy deployment/opening
- spins

Free-Fall Errors

- collision
- air loss

Parachute Opening Malfunction

- premature brake release
- floating ripcord
- hard pull
- pack closure
- hard opening
- rips, tears and blown gores
- total main malfunction
 - improper static line hook-up
 - broken static line
 - failure to pull ripcord or pull too late
 - handle inoperable
 - breakaway/lost
 - hard pull

- deployment device failure
 - bag/sleeve lock
- pilot chute failure
 - trapped
 - in tow
 - hesitation
- inaccurately armed automatic opening device
- malfunctioning automatic opening device
- release of harness connections in mid-air
- partial main malfunction
 - streamer/cigarette roll
 - snivel
 - canopy partial inflation
 - air steal
 - canopy complete inversion
 - canopy semi-inversion (Mae-West)
 - slider hung up at canopy
 - slider hung up halfway
 - end cell closures
 - blown/torn section of canopy
- riser separation
- Descent Errors
 - broken/tangled/twisted lines
 - suspension lines
 - skirt net
 - entanglements/collisions
 - jumper with other jumper (prior to canopy opening)
 - jumper's canopy with other jumper's canopy
 - "walking" on another jumper's canopy
 - main/reserve of same jumper
 - reefing system entanglements
 - broken steering line
- Equipment Release Malfunction
 - inadvertent jettison
 - failure to release
- Reserve Malfunction
 - horseshoe
 - inadvertent/accidental activation
 - improper attachment
 - broken ripcord handle
 - broken reserve static line system

Landing Errors

- improper PLF

 - legs apart

 - one leg extended

 - posture too loose

 - posture too stiff

- dragged on drop zone

- boot failure

 - heels

 - laces

 - soles

 - worn-out condition

- obstacles, e.g., power lines

- unintentional water landing

Missed Drop Zone

Pilot Errors

Failure to Follow Regulations

Hazard Probability

- frequent

- probable

- occasional

- remote

- improbable

Reliability of Equipment/System

- mean time between failures

5. Cargo/Resupply Airdrop Malfunctions

Miscalculated Release Point

Missed Drop Zone

Low Velocity Platform Airdrop (LVAD) Incidents

- extraction phase

 - extraction Parachute

 - failed to deploy properly

 - failed to fully inflate

 - platform

 - excessive tumble

 - failed to exit

 - main recovery parachutes

 - partial main extraction

 - extraction system

 - delay in force transfer

 - no force transfer

- restraint
 - aft restraint not removed
 - incorrect rail/lock settings
- deployment/recovery phase
 - parachute(s)
 - failed to properly inflate
 - failed to properly disreef
 - mid air release of chute(s)
 - deployment line
 - not properly attached
 - line misrouted
 - platform
 - not properly oriented to ground
 - suspension sling(s)
 - filed
 - misrouted
- release phase
 - load was excessively dragged
 - load failed to properly release
 - load overturned
 - upper suspension link did not reach critical angle prior to exit
- container
 - load shifted
 - cargo in container shifted
 - load jammed in rail system
- skidboard and tubular nylon ties
 - pulled through skidboard
 - ties broke
 - skidboard jammed
- release gate
 - knife cut prematurely
 - knife failed to cut

Container Delivery System (CDS) Incidents

- deployment phase
 - static line
 - tangled with load
 - detached from anchor line
 - cable stop failed
 - breakaway type prematurely broke
 - pilot parachute
 - failed to deploy main chute
 - became entangled with load
 - detached from main chute

- main parachute
 - semi inversion
 - cigarette roll
 - deflated from air starvation
 - torn by another container
- container
 - adapter web failed
 - slings assembly failed
 - skidboard detached from load
- after deployment
 - percent of cargo damaged on impact
 - percent of cargo damaged from being dragged on drop zone
- Low Altitude Parachute Extraction System (LAPES) Incidents
 - drogue/extraction phase
 - drogue parachute
 - did not deploy from D-bag
 - failed to fully inflate
 - semi inversion
 - extraction parachute(s)
 - did not deploy from D-bag
 - failed to fully inflate
 - semi inversion
 - jettisoned
 - platform
 - incorrect lock setting
 - left hand locks engaged
 - tandem platforms improperly connected
 - tow plate
 - no force transfer to extraction link
 - failed to properly jettison drogue
 - post extraction
 - platform
 - excessive aircraft height
 - improper load attitude
 - load separated from platform
 - damage to load
 - no damage
 - damaged - usable/operational
 - damaged - unusable/non-operational
- Reliability of Equipment/System
 - mean time between failures

6. Aerospace Biomechanical Factors

Centrifugal Force

Velocity

- terminal velocity

Altitude Loss Rate

Opening Forces

- snatch force

- opening shock/G-forces

- onset rate

- rise time

- canopy inflation time

- peak opening force

Riser Force

Human Responses/Tolerances

- posture

- head/neck flexion

- eyeballs in/eyeballs out

- spinal headward/spinal tailward

- transverse

Torque

Oscillation

- rate

- system stabilization characteristics

Rate of Descent

- canopy size

- canopy porosity/fabric

- altitude

- environmental factors

 - winds

 - temperature

- reefing/disreefing method

Pull Forces Required

- mechanical advantages

- range of motion

- static vs. dynamic

- handle location/type

- one vs. two handed pull

Total System Load

- effects of load weight

- effects of body weight

- body/load position

- load lowering shock

Landing Force/Impact

- impact velocity
- deceleration distance
- body position

Component Compatibility

- parachutists' individual equipment
- harness/container
- equipment release system
- weapons (container)
- equipment configuration/aerodynamics
- fit of components

Reliability/Validity of Biomechanical Measurements

Biomechanical Modeling

7. Aerospace Physiological/Medical Factors

Medical History

- cardiovascular condition
- medication
- nutrition
- dehydration
- alcohol/drug abuse
- prior illnesses/injuries

Physical Fitness

Flexibility

Muscular Strength

- maximal static (isometric) forces
- weight lifting capacity
- dynamic working capacity
- rotary motion
- reciprocal motion
- grip strength
- range of movement/mobility

Fatigue

- sleep/rest cycle
 - duration of cycle
 - short
 - long
 - deprivation
- jet lag

Physiological Measurements

- heart rate/rhythm
- electrocardiogram
- skin/sweat response
- blood pressure
- aerobic capacity
- VO2 max
- oxygen uptake
- blood work
- temperature
- acclimation
- biofeedback

Reliability/Validity of Physiological Measurements

Physiological Modeling

Anthropometric Factors

- body build type
- static body dimensions vs. dynamic dimensions
 - height
 - weight
 - arm dimensions
 - reach
 - span
 - leg dimensions
 - hand dimensions
 - foot dimensions
 - torso dimensions
 - head dimensions
 - eye height
- handedness
- height/stature
- weight

8. Injuries/Illnesses

Head & Neck Injuries

Back & Torso Injuries

Hand, Wrist & Arm Injuries

Foot, Ankle & Leg Injuries

Sprains/Strains

Fractures

Dislocations/Separations

Burns

Cuts/Abrasions

Serious Incidents

- electric shock
- drowning
- strangulation
- asphyxiation
- fatality

Temperature Related Injuries

- frostbite
- hypothermia
- loss of dexterity
- dehydration

Vibration Related Injuries

Noise Related Injuries

Multiple Injuries to Same Jumper

Post Landing Injuries

Acute vs. Chronic Injury

Severity of Incapacitation

- catastrophic
- critical
- marginal
- negligible

Injury Rate

Injury/Fatality Prevention

- clothing (e.g. cold weather/rough terrain)
- personnel amplification devices
 - ankle brace
 - knee brace
- helmet
- oxygen system/mask

Motion Sickness

Altitude Disorders

- hypoxia (oxygen depletion)
- momentary unconsciousness
- decompression sickness
- nitrogen narcosis (bends, creeps, or chokes)

Pressure Change Disorders

Loss of Sensorimotor Abilities

Loss of Cognitive/Perceptual Abilities

Treatment

- drug therapy
- physical therapy
- cognitive therapy
- biofeedback therapy

9. Psychological Factors

Situational Awareness

- altitude awareness

Visual/Spatial Perception

- visual acuity

- visual tracking

- visual field

- visual discrimination

 - depth perception

 - figure/ground discrimination

 - pattern discrimination

 - texture discrimination

 - form/shape perception

- binocular vision

- monocular vision

- brightness perception

- dark adaptation

- color perception

Navigational Ability

Somesthetic/Kinesthetic Perception

- motion perception

- spatial orientation

- body awareness

- tactile perception

- pressure sensation

- comfort perception

- temperature perception

- weight perception

Time Perception

- disorientation

Auditory Perception

- signal detection

- noise interference

- auditory direction

- auditory acuity

Sensory Adaptation

- sensory integration

 - cross-modal interference

- orienting responses

 - equilibrium

Motor Processes

- reaction time
- dexterity
- agility
- motor coordination

Cognitive Processes

- workload factors
 - cognitive capacity
 - number of tasks
 - priority of tasks
 - relationship of tasks
 - time available to complete task(s)
- attention level
 - fatigue
 - vigilance
 - arousal
- memory skills
- recognition vs. recall ability
- comprehension ability
- decision making strategies
- problem solving/reasoning skills
- learning skills
 - habits
 - generalizations

Psychological Stress

- fear

Psychological Measurements

Reliability/Validity of Psychological Measurements

Psychological Modeling

10. Personnel Attributes

Personality Characteristics

- motivation
- risk taking
- emotions
 - emotional responses
 - flight or fight response
 - stress behaviors
 - mental state detractors
 - marital status/security
 - time away from home/family

- confidence level
- equipment confidence
- self confidence
- communications skills
- Demographic Variables
 - gender
 - age
- Geographic Region of Upbringing
 - language barriers
- Military vs. Sport Parachutist
- Sport Parachutist
 - relative work
- Training/Education
 - formal courses taken
 - fidelity
 - transfer of training
 - instructor credentials
 - refresher/sustainment training required
- Knowledge, Skills & Abilities
 - vocational aptitude
 - expertise level
 - student
 - novice
 - expert
 - special qualifications
 - military free-fall (MFF)
 - jumpmaster
 - rigger
 - jump status
 - on
 - off
 - permissive

11. Load/Cargo Attributes

- Cargo Type
- Rigged Cargo Weight
- Rigged Cargo Height
- Rigged Cargo Length
- Load Position Relative to Exit
- Extraction System Type
- Number of Canopies
- Type of Canopies

Platform Type
Platform Length
Release Assembly Type
Container Type
CVR System Used
Breakaway Rigging
Delivery System
 high velocity
 low velocity
 HAARS

12. Other Airdrop Human Factors Issues

History of Parachuting

B. Taxonomy of Airdrop Systems/Components

1. Static Line Personnel Parachute Assembly

Round Pilot Chute

Round Main Canopy

T-10B/C

MC1-1B

MC1-1C

gores

modification windows

Round Reserve Parachute

pack tray

pack opening spring bands

pilot chute

bridle

canopy

ripcord

grip

cable/housing

carrying handle

pins

cones

grommets

Reefing/Disreefing Device

Deployment Bag

Static Line Suspension Lines

suspension line keepers

Static Line Risers

Static Line Bridle

Anti-Inversion Net

Stow Loops

Parachute Pack Harness

main lift web

canopy/quick release assembly

back straps

leg straps

chest straps

ejector snaps

lift-dot fasteners

sizing channels

D-Rings

Pack Tray

Parachute Pack

- pack opening spring bands
- pins
- cones

2. Military Free-Fall Personnel Parachute Assembly

Free-Fall Pilot Chute

Square Main (RAM Air) Canopy

- MC-4
- MT1XX
- MC-5

Free-Fall Suspension Lines

- steering lined/control lines
- deployment brake loops
- control line guide rings

Slider

Trim Tabs

Steering Toggles/Brakes

Free-Fall Risers

Free-Fall Bridle

Canopy Actuation Device

- static line
- manually or automatically deployed ripcord
 - pin
 - stiffener plate
 - grip
 - cable/housing

Deployment Device

- pilot chute
- reserve static line (Stevens system)

Parachute Harness and Container Assembly

- base ring of 3-ring canopy release
- cutaway handle for 3-ring canopy release
- equipment attachment rings
- chest strap
- leg straps
- waistband
- weapon tie-down loop
- equipment lowering line attachment V-rings
- main ripcord pocket
- reserve ripcord pocket
- reserve parachute risers
- automatic opening device pocket

- securing flap for O2 system
- O2 fitting block
- Square Reserve (RAM Air) Parachute
 - free bag
 - reserve parachute deployment system
 - deployment bag
 - pilot chute
 - bridle
- MC4 Reserve (RAM Air) Parachute
 - control lines
 - deployment free bag

3. Tandem Personnel Parachute System

- Oversized Main Canopy
- Passenger/Bundle Harnesses
 - connector links
- Hand Deployed Pilot Chute

4. Individual Equipment & Weapons Containers

- ALICE Pack
- CWIE
- Kit Bag
- M-1950 Weapons Container
 - standard
 - S.A.W. modified
 - 60mm mortar
- Dragon Missile Jump Pack (DMJP)
- Stinger Missile Jump Pack (SMJP)
- All Purpose Weapons & Equipment Container (AIRPAC)
 - weapons container
 - equipment container

Container Components/Attachments

- quick release link
- quick release snap
- side securing straps
- quick fit adaptors
- lowering line attachment strap
- lowering line adaptor web
- lowering line ejector snap
- carrying handle
- tape
- nylon cord

5. Container Release Assemblies

H-Harness

- release tabs
- lower leg tie-downs

Harness Single Point Release (HSPR)

- release handle assembly
- harness attaching straps
- lower leg tie-downs

Parachutists' Individual Equipment Rapid Release (PIER2)

- release handle assembly
- snap shackle with hook
- upper attachment strap

Harness Components

- connector parachute links
- safety pins
- snap hooks
- V-rings
- lowering line stowage pocket
- carrying handles
- securing straps
- leg retaining straps
- quick release assembly
- release knob
- strap lug assembly
- friction adaptors
- wire & lanyard

Lowering Devices

- hook, pile, tape (HPT) assembly
- lowering line
- lowering strap
- link assemblies
- lowering line adaptor web
- ejector snaphooks
- retainer bands

6. Individual Protective/Life Support Equipment

Helmet

- liner
- headband
- neckband
- chin strap
- camouflage cover

Gloves

Goggles

Boots

NBC Overgarments

NBC Mask

Cold Weather Garments

Parachutists' Rough Terrain System (PRTS)

Automatic Opening Device (AOD)

Oxygen System

- oxygen mask
- oxygen hose
- oxygen cylinders
- on/off valve
- prebreather

Floatation Devices

- life preserver

Scuba Gear

Ankle Braces

Knee Braces/Pads

7. Cargo/Resupply Parachute Assembly

Cargo/Resupply Main Canopies

G-11B

G-11C

G-12D

G-12E

G-13

G-14

26-ft

T-10

12-ft high velocity

Cargo/Resupply Pilot Parachutes

68-inch

Cargo/Resupply Extraction Parachutes

15-foot

22-foot

26-foot

28-foot

35-foot

8. Cargo/Resupply Container Systems

A-7A Cargo Sling Assembly

sling straps (4)

parachute harness adapters/friction adapters

D-rings

A-21 Cargo Bag Assembly

sling assembly

scuff pad

fixed quick release strap/assembly

O-ring straps

quick release straps (3)

cover

A-22 Cargo Bag Assembly

sling assembly

scuff pad

support web

D-rings

tiedown straps

lateral straps

- cover
- suspension Webs (4)
- skid
- Double A-22 Cargo Bag
 - special components
 - plywood/reinforced skids
- A-23 Cargo Bag
- High Speed Aerial Delivery Containers
 - high speed airdrop container (HISAC)
 - CTU-2/A container
- Aerial Resupply and Accompanying Bundle System (ARABS)
- Steel Strapping
- Commonly Used Container System Items
 - textile items
 - type III nylon cord
 - 1/2-Inch tubular nylon webbing
 - 80 pound cotton webbing/1/4-inch tape
 - cotton thread (#: 8/4, 8/7, 5, 3)
 - wood items
 - miscellaneous items
 - two-inch adhesive
 - cellulose wadding and felt sheets
 - energy dissipating materials
 - honeycomb
- Other Container System Components
 - adhesive paste
 - altitude sensor
 - sensor with retention line
 - cutter assembly
 - clevis assembly, suspension
 - clevis (shackle), suspension
 - link assembly L-bar
 - modular type-V Platform
 - V-rings
 - wedge kit

9. Cargo/Resupply Platform Systems

Platforms

- type V airdrop platform
- type II modular platform
- LAPE modular platform

Cargo Slings

Cargo Parachute Release Assemblies

- M-1 release**

- M-2 release**

Link Assemblies

- two-point links**

- four point link**

- extraction force transfer coupling (EFTC) link assembly**

- type V link**

 - type V link cover**

- articulating link**

Clevis Assemblies

- large clevis**

 - large clevis cover**

- medium clevis**

- type V clevis**

Modification Hardware Items

- load binder**

- attitude control bar**

- D-ring**

Straps and Webbing

- 60-inch connector strap**

- 120-inch connector strap**

- shear strap**

- 15-foot tiedown assembly**

- parachute release straps**

 - guillotine knife**

 - V-knife**

 - multi-cut**

Commonly Used Platform System Items

- textile items**

 - type III nylon cord**

 - 1/2-inch tubular nylon webbing**

 - 80 pound cotton webbing/1/4-inch tape**

 - cotton thread (#: 8/4, 8/7, 5, 3)**

- wood items**

- miscellaneous items**

 - two-inch adhesive**

 - cellulose wadding and felt sheets**

 - energy dissipating materials**

 - honeycomb**

Other Platform System Components

- adhesive paste
- altitude sensor
 - sensor with retention line
- cutter assembly

10. Tools & Equipment for Rigging

- Packing Tables
- Line Separators
- Stow Hooks
- Parachute Shakeout/Drying Tower
- Technical/Instructional Manuals
- Sewing Machines
- Stitchless/Ultrasonic Repair Equipment

11. Tools & Equipment for Derigging

- Heavy Drop Derigging System (HDDS)
- Knife
- Screwdriver
- Wrench
- Impact Wrench
- Tin Snips
- Hammer

12. Aircraft Components

- Jump Platforms
- Jump Doors
- Jump Lights
- Static Line Anchor and Cable System
- Air Deflectors
- Troop Seats
- Floor
- Emergency Equipment
 - hung/towed jumper retrieval system
 - first-aid kit
- Rollers

13. Training Devices

Lateral Drift Apparatus

Suspended Harness

Hand-Towed Drag Bar

Training Tower

 34-foot tower

 250-foot tower

Aircraft Mock-Up

Mock Door

PLF Platform

Swing Landing Trainer

Wind Machine/Tunnel

14. Other Airdrop Systems/Components

Guidance Systems

 transmitter

 receiver

 Global Positioning System (GPS)

Appendix B:
Suggestion and Comment Form

Appendix B. Suggestion and Comment Form

The space provided below may be used to inform database maintenance personnel of literature not presently included in the database that you feel should be. Please be sure to provide the actual article reprint or book being suggested. The space may also be used to report trouble you experienced while operating the system and/or suggestions for improving the system.

Completed forms can either be left at the PC designated as the AAIRS-HFD workstation, or if the system is being used on another PC, forms can be returned to personnel responsible for distributing the system software. Thank you for your time and cooperation.

Name

Organization and Phone #

Appendix C:
Installation Instructions

Appendix C. Installation Instructions

Hardware and software requirements, which are outlined in Section 2.2.1 and Section 2.2.2 of this manual, should be carefully adhered to.

Before installing the system, it is necessary to check the contents of a DOS file called config.sys. The file may contain files =xx and buffers =xx statements, where xx is a variable number. In order for AAIRS-HFD to run properly, the files statement should equal at least 100 and the buffers statement should equal at least 40. If the statements are already set for at least the recommended amounts, leave the file as is and continue with the following installation instructions. If the files statement is less than 100 or the buffers statement is less than 40, use a text editor to set them appropriately. If there are no files or buffers statements, add each statement on a new line of the config.sys file by using a text editor. Be sure not to delete or modify any other lines of the config.sys file (if any are present) -- they are there for a reason. It should be noted that setting either or both of these statements to a number higher than the recommended amounts, will not improve the efficiency of the system and may even decrease efficiency. Existing config.sys files with statements higher than the recommended amounts should be left as is, however, because the higher settings may be necessary for the proper operation of other applications. **DO NOT FORGET TO REBOOT YOUR SYSTEM IF YOU MODIFY YOUR CONFIG.SYS FILE.**

After all hardware and software requirements and configurations have been met, installation of the system may be initiated with the install.bat batch file. Due to different hard and floppy drive configurations of various computer systems, it is necessary to enter the source and target drive designator after the "install" command.

To begin, insert the Utilities Diskette into the desired floppy drive and type the appropriate command as shown in Table C-1 (other drives may be substituted if necessary).

Table C-1. Installation Commands for AAIRS-HFD.

<u>What To Type:</u>	<u>What Will Happen:</u>
a:install a: c:	Installs system from floppy drive A: to hard drive C:
b:install b: c:	Installs system from floppy drive B: to hard drive C:
a:install a: d:	Installs system from floppy drive A: to hard drive D:
b:install b: d:	Installs system from floppy drive B: to hard drive D:

After entering the appropriate batch file command, the install program creates a directory called "aaIRS" on the drive indicated. The user will be prompted for each diskette that makes up the AAIRS-HFD System. At the time of publication, there was one Utilities Diskette containing installation, backup, and utility files, one Keywords Diskette containing keywords and keyword descriptions files, two System Diskettes containing the executable system file, one Source Diskette containing the source database and text file and one Relations Diskette containing keyword relations files. Note that, as the size of the database increases, so may the number of diskettes required to store the system. The installation batch file is designed to accommodate additional diskettes as the size of the system increases. The contents of each diskette are listed in Table C-2.

Table C-2. AAIRS-HFD Diskette Contents.

<u>Diskette:</u>	<u>Contents:</u>	
Utilities Diskette #1	install.bat	install2.bat
	airsys.dbf	hfi.dbf
	location.dbf	stype.dbf
	foxuser.dbf	foxuser.fpt
	foxswap.com	back.bat
	read.me	
Keywords Diskette	a1.dbf	a1.fpt
	a2.dbf	a2.fpt
	a3.dbf	a3.fpt
	a4.dbf	a4.fpt
	a5.dbf	a5.fpt
	a6.dbf	a6.fpt
	a7.dbf	a7.fpt
	a8.dbf	a8.fpt
	a9.dbf	a9.fpt
	a10.dbf	a10.fpt
	a11.dbf	a11.fpt
	a12.dbf	a12.fpt
	a13.dbf	a13.fpt
	a14.dbf	a14.fpt
	i1.dbf	i1.fpt
	i2.dbf	i2.fpt
	i3.dbf	i3.fpt
	i4.dbf	i4.fpt
	i5.dbf	i5.fpt
	i6.dbf	i6.fpt
	i7.dbf	i7.fpt
	i8.dbf	i8.fpt
	i9.dbf	i9.fpt
	i10.dbf	i10.fpt
	i11.dbf	i11.fpt
	i12.dbf	i12.fpt
	sidas.idx	sidhf.idx
System Diskette #1*	backup.001	control.001
System Diskette #2*	backup.002	control.002
Source Diskette #1**	backup.001	control.001
Relations Diskette #1***	backup.001	control.001

* When installed, these files are restored to aaIRS.exe on the hard drive.

** When installed, these files are restored to sources.dbf and sources.fpt on the hard drive.

*** When installed, these files are restored to relateas.dbf and relatehf.dbf on the hard drive.

Installation of the Utilities Diskette occurs upon entry of the appropriate installation command found in Table C-1. Next, the user is prompted for the Keywords Diskette which employs the use of the simple DOS COPY command. Upon entering the correct diskette and pressing any key, the files are automatically copied onto the hard drive (see Figure C-1), and the system prompts the user for the next diskette in the series. If the user inserts an incorrect diskette, the prompt for the correct diskette is repeated. When the correct diskette is inserted, installation calls for the next diskette in the series.

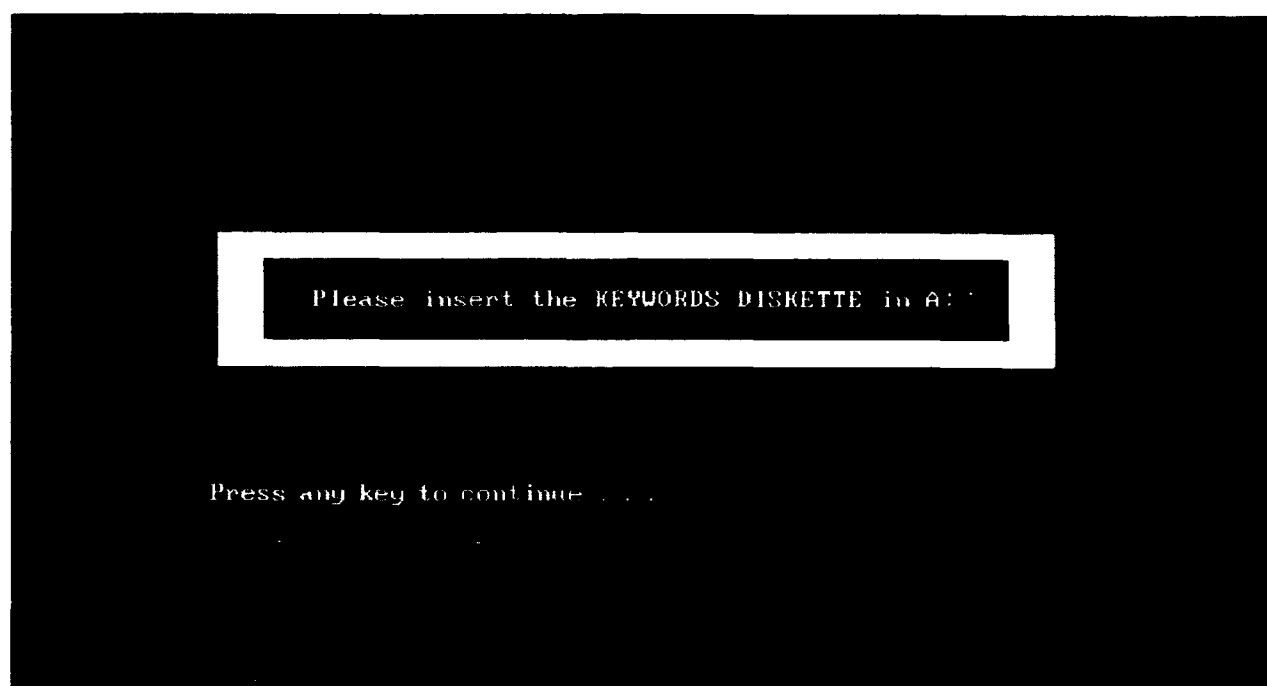


Figure C-1. Installing the Keywords Diskette.

Next, the user is prompted for the System, Source and Relations Diskettes which employ the use of the more involved DOS RESTORE command. Files installed with the DOS restore command are those that may eventually, if not already, occupy more than one floppy diskette. The System Diskettes are prompted for with a message similar to that displayed in Figure C-2.

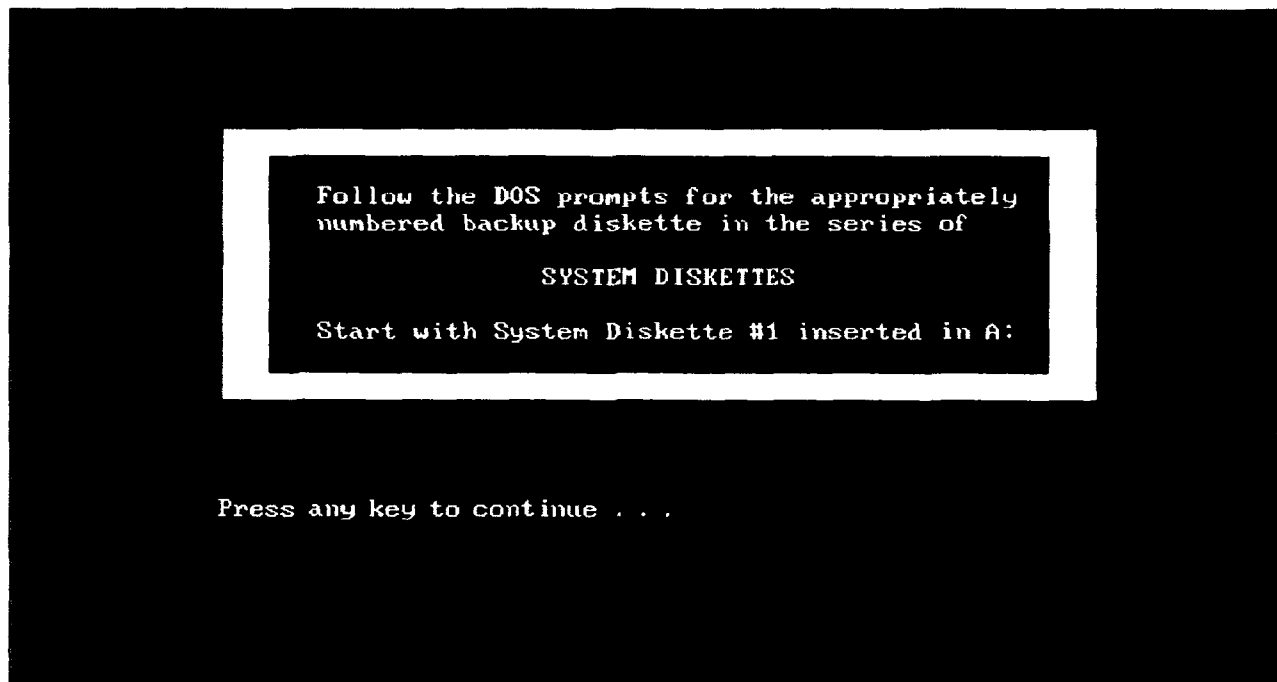


Figure C-2. Installing the System Diskettes.


As displayed in Figure C-2, the RESTORE command requires the user to start with the first diskette of the series being installed inserted in the designated floppy drive. After pressing any key, however, the restore command repeats the prompt to insert a diskette. This second prompt for inserting diskette # 1 can be ignored because the user has already inserted the first diskette. Upon inserting the correct diskette from the appropriate series and striking any key to continue, the file is automatically restored, and the user is prompted for the next diskette in the series (if any). If the user inserts an incorrect diskette, the prompt for the correct diskette is repeated. When the correct diskette is inserted, installation proceeds with the next diskette in the series. The Source and Relations Diskettes are installed similarly to the Source Diskettes. When the entire system has been loaded, DOS returns a message (see Figure C-3).

Appendix D:
Alphabetical Listing of Error Messages

Appendix D. Alphabetical Listing of Error Messages

The following messages are not covered in the body of the manual. Most will only occur if proper operating procedures are not followed, or if there is trouble with the hard disk or operating system of the host PC.

Bad command or filename

This is a DOS error that may occur when attempting to begin a working session with AAIRS-HFD. Check the AAIRS-HFD database directory for the executable file called aairs.exe. If not there, check for *.exe. If there is another .exe file, try typing it followed by a . If there are not other .exe files, follow instructions in Appendix C and reload the system. This error may also occur while trying to install the system on a computer that is supported by DOS version 3.3 or earlier.

C:\path\filename.ext already exists, overwrite?

This type of error is due to an improper shut down of the system. Note that the drive, path, file name and file extension will vary depending on the file in question. The user should respond "Yes" to the overwrite request. The files being overwritten are of a temporary nature and would have been deleted if the system had been shut down properly.

Cannot create file

The operating system has returned an error to FoxPro indicating that the new file cannot be created. The inability to create a new file is usually the result of a full disk or directory. You may receive this error while conducting either a text or a keyword search. Temporary files created by the system during searches are not obvious to the user because their creation is hidden. If this error occurs, cancel the operation and check the hard disk for available space.

Cannot update file

This error message is very unusual and only appears if a serious problem such as a full hard disk or total disk failure occurs while FoxPro is attempting to write to the hard disk. Choosing "ignore" in response to this error may be all it takes to get around this error message. Running the DOS utility CHKDSK with the /f option, may also reduce the chances of this error occurring.

File does not exist

The file you have specified does not exist. Try entering file again, being careful to include a path if the text file for import resides in a directory other than Natick's AAIRS-HFD directory. Also, be sure to include the file extension.

File read error

An error was returned by the operating system while FoxPro was attempting to read a file. System files that are unable to be read may reside on a bad sector of the hard disk. Consult DOS manual(s) for host PC.

File write error

An error was returned by the operating system while FoxPro was attempting to write a file. Most often, this error is the result of an attempt to write to a write-protected diskette, but may also be the result of a bad sector on the hard disk. Consult DOS manual(s) for host PC.

Index does not match database file

The index expression for the current index uses variables which are not contained within the current database. This error should not occur unless the system has been corrupted; try reloading system if error persists after canceling the operation and rebooting.

Insufficient memory

There was not enough memory for FoxPro to complete an operation. Cancel the operation and try rebooting and/or removing any memory-resident programs that may currently be installed on host PC.

Internal consistency error

An internal FoxPro table has been corrupted. If this error occurs, inform personnel responsible for maintaining the database; contacting the FoxPro Technical Support Line may be necessary.

Invalid character in command

A source line of code contains an invalid character. This is probably caused by corruption of the system files. Reloading of the system from uncorrupted disks is recommended.

Invalid drive specification

- The floppy and/or hard drive specified during installation or backup of the system is not valid. Abort the operation and try again with correct drive designator.

Invalid or missing resource file

Either the FoxPro resource file (FOXPRORT.RSC) could not be found (in the system directory or along the DOS path), or the resource file found has been corrupted. Try reloading uncorrupted copies of the system disks.

Invalid directory

Check to be sure the system was in fact installed in the aairs directory. The system may have been installed in a directory other than aairs or it may have been removed from the host PC all together.

Memo file is missing/invalid

An attempt was made to use a database file whose associated memo file (.DBT or .FPT) has been deleted, corrupted or cannot be found. Try loading an uncorrupted copy of the system disks.

Menu is already in use

An attempt has been made to activate a menu that is already active. This error occurs if the keys are quickly and erratically pressed. Choosing "ignore" when this error occurs will solve the problem.

No memory for buffer, file map, or filename

It is impossible to allocate memory for a buffer or a FoxPro internal resource. This message is very unusual and will occur only in situations where available memory is extremely limited. Consider adding memory to the host PC or removing some memory resident programs to give FoxPro more working memory.

Not enough memory to use database

There was not enough memory to open an additional database. Try removing some memory resident programs to give FoxPro more working memory.

Not ready error reading drive A**Abort, Retry, Fail?**

DOS returns this error when a diskette is not inserted in the floppy drive specified during installation or backup of the system. To continue the operation, insert appropriate diskette in designated drive and press "R" for Retry. To cancel the operation, press "A" for Abort.

OS memory error

There is a problem with your DOS free memory chain. Consult DOS manual(s) for host PC.

Popup is already in use

An attempt has been made to activate a popup that is already active. This error occurs if the keys are quickly and erratically pressed. Choosing "ignore" when this error occurs will solve the problem.

Position is off the screen

A row or column number specified in the system is larger than the number of rows or columns on the screen, window or printer. Operation of the system on a PC that has a monitor smaller than standard size or a printer with width smaller than 8 1/2" may cause this error.

Printer not ready. Retry?

The printer device specified is currently not accessible or the printer may be off line. Be sure printer is on line and ready for data, and then choose to continue with the request. Please note that this error also occurs during the cancellation of a print job and should be treated as specified in the appropriate section of this report.

Record is not in index

A database for a keyword list in use has been modified without the index having been active or reindexed. Choosing "ignore" in response to this error should solve the problem.

Run/! command failed

Most often this error message is a result of insufficient free memory to support the execution of a DOS command from within FoxPro. This will likely occur while the system is resetting itself after a search or while the backup option of the development version is being run. It is suggested that the user cancel the operation and follow the guidelines below.

Firstly, the command.com file must be accessible via the DOS environment variable COMSPEC. Secondly, memory resident programs, such as shells loaded prior to start

up of the database, should be cleared from memory before trying the operation again. Due to canceling operation of the database during a search, a subsequent search may generate an error message that states: "C:\path\filename.ext already exists, overwrite?" Simply follow suggestions listed for this error message.

Too many files open

FoxPro has attempted to open more than its internal limit of files. This may be caused by the config.sys files statement not being set high enough. Choose to "cancel" the request and check DOS config.sys file (see Appendix C, Installation Instructions).

Unable to create temporary work file(s)

The database system has attempted to create temporary work files and was not permitted by the operating system. This is caused by a full directory or a permissions problem concerning access to the system directory.

Use of transgressed handle

If this error occurs, inform personnel responsible for maintaining the database; contacting the FoxPro Technical Support Line may be necessary. There may be a memory conflict; try cleaning up your autoexec.bat file of any memory management or memory resident programs or files and rebooting.